THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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THE

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(J. A. BERLY'S).

1910 EDITION NOW READY.

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INSANE COMPETITION.

THAT a reasonable degree of competition is an excellent stimulus to progress and invention in industrial affairs is a self-evident truism, daily exemplified, just as the complete absence of competition obviously leads to stagnation. "As iron sharpeneth iron, so a man sharpeneth the countenance of his friend." But any good thing in excess becomes an evil, and too much competition tends to bring about the lowering of quality, the sweating of labour, and not infrequently the ruin of the employer.

It is, unfortunately, a notorious fact in electrical circles that cut-throat competition prevails in almost all branches of the industry—it is practically only in special lines that a fair margin of profit can be obtained—in spite of the fact that there is no great scarcity of work; business, indeed, is steadily improving all round, and the demand for electrical supplies is growing. A movement of this nature is usually accompanied by a corresponding advance in prices, higher wages and greater prosperity generally. How is it, then, that in the electrical trades we hear on all hands—from the manufacturer, the contractor and the factor—that "Prices are Rotten!"?

From all accounts—and we have inquired into the state of affairs in many different directions, in the North, the Midlands and the South—there never was a time when it was so difficult to obtain any profit on industry, let alone a reasonable profit. Why? Even the contractor, who has to pay for manufactured materials, objects—strange as it may seem—to the low prices ruling; the manufacturer, he says, in his eagerness to sell will give long credit to any jerry wireman who quotes at cut prices for contracts, and eventually goes bankrupt, only to make room for another upstart contractor. Were prices at a decent level, it would be more difficult for the latter to get a footing. Well-established and sound contracting firms who are well qualified to carry business through satisfactorily have to be content—because they will not do bad work or work at a loss—to see good business go past them to new and weak firms whom the manufacturer would rather not supply with the materials because he does not know when, if ever, he is going to get the money. Thus the new-comer does no permanent good to himself, while he is in some cases actually weakening firms already established in the field. Again, the manufacturer is accused of selling direct to the private consumer at trade prices, further spoiling the market, and, like the contractor, he in turn complains of the extreme difficulty of obtaining a margin of profit. There are not wanting those who ask whether it would not be perfectly legitimate for the manufacturer to keep his own staff of wiremen and do contracting work in order to avoid filling orders for supplies from small contractors. Looked at from the business point of view of the manufacturer who wants to be paid for his goods, the question is not a trivial one. There is a fair quantity of important contracting work going, and a good demand for manufactures, and many works are very busy,

but there is nothing in the nature of an understanding, and the chief offending price-cutter is frequently stated to be a manufacturer a "mile away from here"—not a factory in some other country.

There are particular sections of the industry of which we think as we write, where prices are so low that if the present big volume of business were to be reduced, rendering double-shift or overtime unnecessary, the small profit now being earned would be converted into an actual loss on working.

Undoubtedly, the degree of competition experienced in most departments is not merely unhealthy—it is senseless. Who can possibly benefit by it?

Instead of putting up their prices by degrees, as they feel the demand improving, electrical traders seem determined to keep them down to the lowest value possible—which they appear to have reached. Surely it is time to do away with this ridiculous condition, and we most earnestly exhort our readers every one to demand a fair price that will return a fair profit. Why should the electrical industry starve itself? It is folly!

Travellers Abroad.

WE have heard various reports lately which point to the practical certainty of a large expansion occurring in exports of British electrical and allied engineering manufactures very shortly. More men of standing in these industries are scouring the Globe than at any previous period we remember. The protests of a year or two ago that the right men to send on such expeditions, armed with experience and with power to act authoritatively, were the very men who could not be spared from the helm at home, were little more than lame excuses. The fact that so many are now away, while others have just returned, and yet others are just about to start off, in spite of there being a good deal of business going through the works, is a sufficient reply.

If a big engineering business cannot in these days, with all our knowledge of organisation, be planned and worked on lines which allow one or more of the heads to be away for a few months without things going wrong, it is not a testimonial to the abilities of those responsible for its organisation and management. The old idea that a master or managing director must be for ever on the spot or standing over his workmen, his foremen, or his administrative staffs, may have served its purpose once upon a time, but it is a short-sighted policy now.

Efficient organisation enables smooth running under heads of departments whether the "cat's away" or not. There ought always to be in an efficiently-managed concern one or more assistants capable of quite satisfactorily filling the *rôle* of substitutes for the chief. We welcome heartily the foreign travel activity of the moment, and cannot but believe that excellent business will be the outcome for all who have had the courage to take action. Some firms are leaving the matter to local agents and do not interfere, simply accepting the business as it comes. That is only a makeshift policy for large concerns, though for small ones probably other measures may be too costly. Others have seen the wisdom of getting personally into touch. H.M. Trade Commissioner for South Africa has been touring through the manufacturing centres of Great Britain and he has made a strong point of the necessity for heads of firms making a personal visit to the South African market. Some wise and interesting observations on this subject also appear in our report of the meeting of Bruce Peebles & Co., Ltd., printed on another page of this issue. Most of our manufacturers are already busily engaged upon export orders, and the vast scope that still remains for their increased activities should be a great encouragement to them.

Copper.

A REVIEW of the copper situation, as shown by the 1909 statistics in the *Morning Post* for 14th inst., leaves us with the pleasant impression that the outlook is hopeful for the consumer. The American production for 1909 is given as follows:—United States, 549,000 tons; Mexico, 62,000; Canada, 24,000; total, 635,000 tons, an increase for the States of nearly 16 per cent. In comparing the results for the various states of the Union, Mr. Dewhurst (the writer of the *Morning Post* article) notes that there is little change for Arizona and Michigan, but the increase for Montana is 31,000 tons, for Nevada 19,000 tons, and for Utah 17,000 tons. Montana now heads the list with a production of 157,000 tons.

The total output of refined copper for the United States was about 708,000 tons. Mr. Dewhurst considers that an output of one million tons may be anticipated in three years' time. Large deposits of low-grade ore are at present being opened up, notably in Arizona. Other countries may be expected to increase their output, such as Mexico, Africa and Australia.

The combine, Mr. Dewhurst points out, is at present limited to an amalgamation of Utah Copper, Boston Consolidated, and Nevada Consolidated, and cannot be considered complete without the interests of Phelps, Dodge and Co., and the Calumet and Hecla.

The visible stocks for the United Kingdom, France, and the United States stand at 172,000 tons, and beyond this the invisible stocks may be quoted at 75,000 tons. With this quantity waiting for the market, and the low-grade mines able to produce at a profit on a considerably lower price than at present, it is difficult to see how the price can continue to be maintained. It will, however, be remarked that anything approaching a "slump" or "panic" might, by closing down the more expensive mines, have an effect decidedly reactionary.

In a manner most remarkably expected, falling-off in prices (and consequent easy acquisition of securities) coincides with rumours of our old friend, the "Billion-dollar Copper Merger." With this modest sum, according to *Telephony* (January 29th), it is proposed to amalgamate properties with capital aggregating 240 million dollars, thus leaving an ample margin for carrying on the campaign. The most important additions to the already effected consolidation (Utah, Boston Consolidated and Nevada Consolidated) are the Amalgamated and Anaconda concerns, with the Butte Coalition next. If this agreement comes into effect, it will certainly be a step towards the Copper Trust, as well as evidence that sufficient capital (even if not precisely to be described as a "billion") is available to put the matter through if so desired. Whether the mines which stand to make the most profit out of such a combination, viz., the cheap producers, will be obliged to come in, remains to be seen.

Statistics for mid-month (Messrs. H. R. Merton's) show visible supplies still edging up, 114,102 tons at time of writing. Over 100,000 tons lie in English stores. On the supplies figures Spain shows low and Chile high, but little can be gathered from figures referring to a fortnight only.

The Sale of Units.

IN our issue of January 14th we welcomed the formation of the Electric Supply Publicity Committee as being both opportune and also suggestive of possibilities in the way of a more comprehensive development. We ventured the view that the situation demanded not merely concerted action in the way of publicity matters (excellent though such scheme is as a beginning) but a really complete business-getting organisation, embracing every detail involved from the first circularising to the final act of salesmanship. The progress in any direction has, therefore, our full commendation, and we are glad to note that the Committee have just taken a practical step in issuing a poster and a circular. These have been sent round, we understand, to every undertaking in England, Scotland and Ireland, inviting their co-operation. The organisation is desirous of extending its borders and covering the whole of the undertakings. In fact, at present although the title implies restriction in the words "London and District," it already includes some systems outside.

Although, therefore, the present step is merely preliminary, it certainly should receive the immediate consideration of the

various undertakings at present not in touch with the Committee. It affords, in fact, an excellent opportunity of signifying acquiescence in the development of concerted action. Further, there is no doubt that just at present there is a demand for immediate attention to be given to the question of business-getting. The cudgel of lamp economies which have been used to beat down the revenues of the undertakings is an equally potent weapon with which to war against gas competition, especially in the hands of a comprehensive organisation working on systematic lines. The present scheme is believed to be well equipped for such a purpose. It is essentially a business organisation with but one end in view—the sale of units. At present only a first step has been taken. That the purpose consistently followed out should take the organisation into broader channels is, in our opinion, the only logical course. We sincerely hope that this will very speedily happen, for as we have already said publicity alone is far from being sufficient to meet the present position. Anyhow, its future depends to an extent on the support that it receives in its early stages, and we think it well befits all undertakings to seriously consider whether they will not find it to their interests to give such support.

The sub-committee appointed to deal with the details of the scheme are Messrs. Cunliffe Owen and H. B. Renwick, representing companies, and Messrs. A. C. Cramb and E. Sayer, representing borough councils. Mr. F. J. Walker is acting as hon. secretary.

Railways and Navigable Canals.

THE eighth session of the International Railway Congress will be held in Berne next July, and some of the papers to be read and discussed have already been published. In the November bulletin of the Congress one of these treatises is given which will afford interesting comparison with the results of the Canal Inquiry as given in these pages recently, and with the exhaustive report of Mr. Lindley on Belgian, French, and German Waterways; the subject is the "Influence of Navigable Waterways on Railway Traffic," both as feeders and as competitors, and the authors are two experts on the subject, viz., M. Colson, Inspector-General of the Ponts et Chaussées and Councillor of State, and M. Marlio, engineer, also of the Ponts et Chaussées and chief of the Technical Department at the Ministry of Public Works. A lengthened notice of these by M. A. Rangères was given in the *Génie Civil* of January 8th. The following table gives the lengths of railways and canals, and the traffic on them, in seven different countries, according to the latest returns:—

Country.	Railways.		Navigable waterways.	
	Length. Miles.	Traffic in million ton-miles.	Length. Miles.	Traffic in million ton-miles.
Russia ...	30,449	55·44	35,420	55 44
Germany ...	34,798	70,646·40	8,078	23,760·00
Austria ...	11,682	16 156 80	1,616	11·40
Hungary ...	10.564	7,920 00	1 926	2,376 00
France ...	24,887	28,036 80	7,457	8,395 20
Belgium ...	2,858	not given	1,243	1,900·80
Netherlands	2,113	not given	3,231	not given

The Russian railways cost £12,424 a mile; the return on the capital is 4 to 5 per cent., and the rates for goods average only 0·482d. per ton-mile. Of the waterways only 1,243 m. are artificial—the charges on them appear to be higher than on the railways. Nine per cent. of all the goods traffic on the latter was interchanged with the waterways. The Austrian railways cost £23,174 a mile, and return 4·4 per cent. on the capital. The rates for goods range between 1·292d. and 0·506d. per ton-mile for full wagon loads. The rates on the canals are only from 0·218d. to 0·094d. per ton-mile. The Hungarian railways cost £21,243 a mile and return 4·2 per cent. The Netherlands railways £55,424 a mile. Similar figures for Germany, France and Belgium are to be found in Mr. Lindley's Report, in Vol. VI of the series, issusd last October; but as both railways and waterways are mostly under Government control on the Continent, the figures for the latter cannot compare with any private undertakings; no tolls, for instance, are charged in the majority of cases, although the maintenance of many of the canals is an exceedingly heavy burden on the Governments of which they would gladly be relieved, but dare not for fear of a popular outcry.

The writers of the papers corroborate what has been written in these columns as to the advantages of rail carriage over that by canals, in spite of the fact that the latter are exempt in the countries named from many of the charges which the railways have to meet before they can show a profit; these charges are thus enumerated:—Maintenance of permanent way, administration expenses, interest on capital, rates and taxes, free transport of soldiers and other officials, cost of statistical returns required by Government, restrictions on rates, short hours of labour, superannuation, and so forth. In fact, on the waterways the customers have practically only to pay the actual cost of transportation.

By far the greater part of the navigable waterways on the Continent are rivers, the upkeep of which costs but little (when the only drawbacks are frosts and occasional floods), and they can always be improved to advantage, but the authors do not recommend the construction of new canals, wherever more transport facilities are required by reason of congestion on the existing ones, and they decidedly prefer railways. M. A. Rangères sums up the conclusions in these words:—Even in the case of those heavy goods, which are claimed by the boatmen as specially their own, the railway is the most economical means of transport, wherever nature has not provided big rivers, and a gentle flow in them. Moreover, railways have nearly always the advantage over waterways of proximity, owing to the ease with which they penetrate into the very heart of the region to be served, and into the various parts of the factories where they may be wanted. It will be interesting to note the observations made at the Congress on the reports of our Commission.

The Institution and the Electrical Industry.

THE correspondence between Mr. Garcke and the Institution of Electrical Engineers which commenced on December 10th (published in our issue of December 24th) is concluded by a letter from the secretary of the Institution dated 18th inst., and an acknowledgment by Mr. Garcke, published in another column. The position taken up by the Council will, we feel sure, meet with general approval.

Failing action by the Institution itself, Mr. Garcke claimed that it would "render the industry an inestimable service if they [the Council] would at this juncture provide" an organisation to be constituted either entirely within, or partly within and partly outside, the Institution, with a view to improving the general industrial conditions under which electrical concerns are working. To this the Council reply that, while they will continue to do all in their power "to provide the general advancement of electrical science and its applications," the provision of the special organisation suggested by Mr. Garcke is not, in their opinion, within the proper scope of the Institution.

There is no occasion to limit unduly the sphere of action of the Institution, but it must be clear that its sphere of influence must be narrowed as its sphere of action is widened to include commercial or political questions. Science develops into industry, and its applications into trade, to the general advantage, but an Institution which seeks to combine the functions of the advancement of science and the promotion of trade would have within itself all the elements of disintegration. It should be equally clear that an independent organisation deriving its influence from the Institution must, by its actions, affect the influence of the Institution. Hence, much good that the Institution can now do by exercising its influence must remain undone.

THE ELECTRICAL APPARATUS CO.'S WORKS AND PRODUCTS.

WE recently visited the works of the Electrical Apparatus Co., Ltd., Queen's Road, Battersea, and inspected their processes of manufacture. The works were erected only 18 months ago, but have already had to be considerably extended to cope with the demand for the company's leading products—electricity meters and motor-control gear. A view of the machine shop is given herewith; most of the parts requiring machining are comparatively light, and therefore heavy machinery is not needed, but the company have provided themselves with an equipment which enables them to make the whole of their apparatus themselves, excepting only such items as meter recording wheels, &c., which are manufactured by specialists. All their manufactures are also of their own design and under their own patents, their engineers having acquired experience in the most modern methods of manufacturing meters, motor controllers and fuses both in this country and in the States.

FIG. 1.—E.A.C. WORKS: MACHINE SHOP.

FIG. 2.—THE E.A.C. METER, OPEN.

The principal manufacture conducted by the company is that of the E.A.C. high-torque meter (fig. 2), which has been described in our "New Devices" section; in this meter, which is of the shunted motor type, a flat disk armature is used, encased in aluminium, which serves for braking. The moving part is thus extremely light, and the 1½-ampere meter, which has been specially devised for small metallic-filament lamp installations, starts with a current of about one-sixth that of a 30-watt wire lamp. The simplicity of this meter enables its cost to be brought down to the minimum, and it is already widely used both in this country and abroad; but efficiency has not been sacrificed to price. The whole of the insulating material (apart from the armature winding) is of mica, and 18-carat gold is used for the commutator and brushes—the only certain way of overcoming commutator troubles. Each armature is tested with a pressure of 500 volts before it is passed for service. The dials are of the cyclometer type, and are tested in an ingenious way devised by the company to ensure freedom from friction; a little propeller is attached to each train, and placed in the current of air produced by a small electric fan, which suffices to drive the gear throughout its whole range. The least friction in the gearing is at once revealed

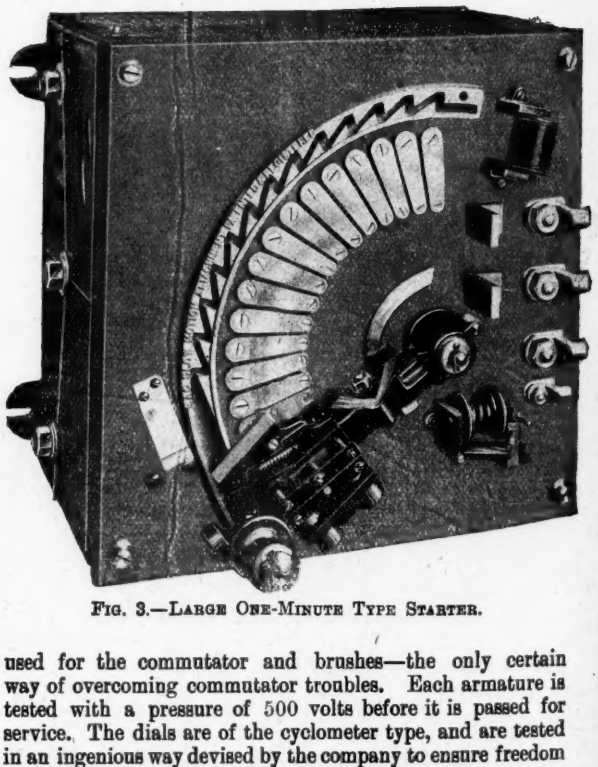


FIG. 3.—LARGE ONE-MINUTE TYPE STARTER.

by the stoppage of the train, which is then rejected. Besides the pattern for use in this country, the company have designed a slightly different model for sale on the Continent and in America, and they have met with much success both with their meters and with their motor control gear in the Colonies and on the Continent of Europe.

Another well-known feature of the company's activities is the electrolytic shilling-in-the-slot prepayment meter, described in our issue of July 24th, 1908, which has been widely adopted, with detail improvements effected since our notice appeared.

A complete series of motor-control apparatus is made by the company, of which we illustrate some examples herewith. Besides their standard motor starters for ordinary requirements, which are turned out at competitive prices, they make a patent slow-motion "one-minute" starter, in which their patent ratchet device is employed, as illustrated. It is impossible to switch this on quickly, though it flies off with perfect freedom, and a special advantage of the

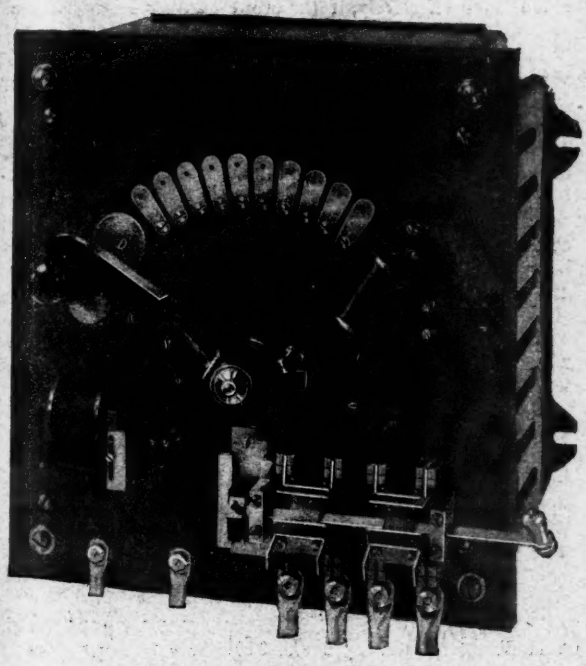


Fig. 4.—Reversing Starter.

jerky step-by-step motion obtained is that the brush moves quickly forward at each step, and is brought to a dead stop in the centre of each segment, so that burning of the edges of the contacts is prevented. Carbon break and magnetic blow-out are provided, and the resistance is very conservatively rated. Another type is the E.A.C. series regulator, which is provided with an auxiliary lever; the latter alone is controlled by the hub spring, and is brought into action by moving the handle slowly to the right until the auxiliary lever is held by the magnet; the main lever can then be used to regulate, but, on failure of supply or excess of current occurring, the auxiliary lever flies off and carries the main lever with it. The other controller shown is a reversible starter; the reversing switch is interlocked with the starting lever, so that it cannot be moved unless the current is completely cut off; nor can the starting lever be moved if the switch is not properly closed. A special advantage is that in switching off, the motor cannot be accidentally started in the wrong direction by moving a lever too far. These are only a selection from the various patterns of controller made by the company, who are in a position to undertake the manufacture of rheostats of every description.

They are also makers of their patent "Koolark" fuses, and are at present enlarging the department which deals with this branch of work, in order to be able to supply fuses of all sizes and to suit all centres, from stock. They recently obtained the contract from the Admiralty for the supply of all enclosed fuses over 30 amperes' capacity for a period of two years.

It will be seen, therefore, that the Electrical Apparatus Co., Ltd., has already laid a sound foundation, and has a promising future before it. We have pleasure, in conclusion, in tendering our thanks to Mr. E. B. Schattner, chairman of the company, for courteously conducting us over the works, in the management of which he is assisted by Mr. R. Amberton.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Classes for Shift Workers.

As shift workers in the electrical engineering profession, we should be glad if you would publish this letter, as our cause of complaint also affects thousands of others placed similarly to ourselves. As there are, with the exception of a few cases, no classes for the shift worker at the average provincial technical school, the shift man has to miss one out of three classes or study at home. We think his best method is to join a good correspondence school, as is the case with ourselves.

Now, if you join a correspondence school alone you are not eligible to sit for the "City and Guilds" examinations, as it is not recognised as a standard school, although, in our humble opinions, we consider at least one as being very practical and efficient. At present one has to bear the expenses of two schools, in the one case light certainly, but it is the inconvenience we complain of.

We want to know why there are no shift classes in every big town, or why there are no standard examinations for the man who studies at home besides the correspondence school examinations, which, we think, are recognised abroad, if not in England, the land of prejudice. In any case, we know which we prefer.

I.C.S. Students.

The Manufacture of Cement.

Our attention has been called to Mr. Rhodin's letter in your issue of the 18th inst.

We leave it to Dr. Colloseus—if he thinks it necessary—to reply to his criticism on the theoretic explanations of the process.

As regards the practical results—which alone concern us—we need only say that we have manufactured and sold thousands of tons of cement, which has been subjected to every physical test to which cement is put, with the most satisfactory results.

Coltness Iron Co., Ltd.

Newmains, *February 18th*, 1910.

The Straight Tip.

As Mr. Seabrook has had no experience in running a showroom without trading powers, it appears to me he is not fully qualified to speak with authority on this matter. Granted that more business would result, and probably better satisfaction would be given if such powers were held, he is yet certainly wrong in advocating the shutting-down of canvassers and showrooms. Some three years ago I inaugurated both in Ilford, and the results up to the present have been very satisfactory. As we are one of the unfortunate authorities referred to who up to the present have been unable to obtain powers, we have worked in with our local contractors, and in the showroom have a large board with the names and addresses of approved contractors to which customers are referred. All goods in the showroom are plainly marked with the price at which any of these contractors will supply them, and the same names and addresses are given to any other persons inquiring by letter or otherwise. In no case has annoyance been caused to prospective customers, as several contractors are in the immediate vicinity of the showroom, one, in fact, being next

E

door, and we have never been informed that our arrangements are "incompetent" or "unbusinesslike."

It is not to be expected that the ordinary contractor can open a showroom and introduce the latest types of lamps, heating and cooking apparatus, &c., to the public in the same manner as a supply authority can, and if these showrooms are shut down as suggested, I am of opinion that not only will the supply authority suffer, but both the public and contractors will also be the losers.

Since our showroom was started, I am sure our local contractors have benefited by it and found it of advantage to themselves, and although there was a little feeling against it at first, this has quite died out.

Until we can obtain powers we shall doubtless continue on the same lines as at present, and even when we do obtain them, we shall very probably give the wiring out to contractors, notwithstanding Mr. Seabrook, merely utilising them for letting out apparatus, &c., on hire.

Arthur H. Shaw,
Engineer and Manager.

Electricity Supply Offices, Ilford.
February 15th, 1910.

Disposal of Sawdust.

There has been a difficulty in the past in this town due to the disposal of sawdust, chippings, &c., from the local sawmills. The way it is got rid of is by burning large heaps on the outskirts of the town, and being well smothered, the amount of smoke given off is negligible.

This way, however, is wasteful, and I think the best way to dispose of sawdust is to burn it under a low pressure boiler on the site of the mill, the steam generated being distributed by means of radiators in a specially constructed drying room, in which the timber is stored before being worked.

It has the advantage that the timber does not have to remain stocked long for drying purposes and is much easier to work in the saws and planers; also the timber will fetch a better price owing to it being dried.

T. Hall,
Chief Assistant Engineer.

Electricity Department, Burton-on-Trent.
February 15th, 1910.

Cinematographs.

There seems to be some confusion as to the meaning of the new Home Office Regulations.

Rule 6, Paragraph C, states:—"No current at a higher pressure than 110 volts shall be used within the enclosure."

This has no reference to open-circuit voltage, but merely requires that when the arc is burning the total P.D. across arc and regulating switch inside the enclosure shall be kept below 110 volts. The object of the Regulation is to exclude from the operating chamber the large auxiliary resistances which are necessary where only a high voltage supply is available, and the rule is easily complied with by the use of suitably arranged resistances.

The Electrical Apparatus Co., Ltd.

Battersea, *February 18th*, 1910.

Considerable ambiguity appears to exist as to the interpretation to be put on Clause 6, Section C, of the new Regulation for the control of cinematograph exhibitions, issued by the Home Office.

The obvious intention of the Clause is to limit the pressure within the enclosure to as low a figure as possible without unduly hampering the promoters of such exhibitions. To this end a limit of 110 volts has been specified, and a small regulating resistance is permitted near the lamp. Further, according to some of your correspondents, a pressure of 440 volts may exist within the enclosure so long as the pressure while the lamp is working does not exceed 110 volts.

The limiting of the pressure to 110 volts while the lamp is working is beneficial, in so far as it excludes large banks of resistance from the enclosure, but permitting a pressure above 110 volts, and up to, say, 440 volts when the arc is extinguished, defeats, in my opinion, one of the main objects of the Regulation—namely, that of minimising the risks attendant on high-pressure current in the neighbourhood of the inflammable films.

The wording of the clause is certainly ambiguous:—"No current at a higher pressure than 110 volts shall be used within the enclosure."

The insertion of the word current would appear to indicate that the framers of the rule had in mind the possibility of a higher pressure existing inside the enclosure so long as current did not flow at that pressure. What would be the position of the cinematograph proprietor in the event of a leakage occurring between the two leads within the enclosure, of sufficient resistance to set up a higher pressure than 110 volts across them? Current would then be used at a higher pressure than 110 volts.

The rules would be very much simplified, made more explicit, and fulfil their intention to safeguard the public much more effectively, if the word current in this clause were deleted.

It may be argued that limiting the pressure to 110 volts would be a serious handicap, and would involve the cinematograph proprietors in much expense; but this is not so. My firm have on the market a special cinematograph dynamo, which not only enables the pressure within the enclosure to be kept within the limits laid down by the Act, but goes further than this. It enables the pressure within the enclosure to be kept down to the actual working voltage across the arc lamp carbons—that is to say, 50-55 volts as a maximum, and *falling to zero* when the arc is extinguished.

This machine also obviates the use of *all* resistances, whether within or without the enclosure, with a consequent reduction in the risk of fire in the building as a whole and improvement in the atmospheric conditions.

Due to the absence of resistances, the saving in current is very considerable, and the expense involved in the purchase of the dynamo is soon recouped by the greatly diminished bill for electricity. The burning of the lamp is also much improved when working off this special dynamo, as a much steadier current is obtained than is possible when resistances are used for regulating purposes.

A. C. Coubrough,
Manager of Electrical Department, Mather & Platt, Ltd.

Manchester, *February 21st*, 1910.

Referring to "Uniformity's" letter, there is no difficulty in making use of direct current at 250 volts, and at the same time never having more than 110 volts in the box, and that without using a motor-generator; provided, of course, that the main switch is kept outside, this could easily be done, and it could still be operated from the inside by a pull and push rod working through the wall.

As far as the lighting of the box itself goes, I should suggest a bulkhead fitting fixed either in the roof or wall, to be got at from the outside only.

If your correspondent cares to communicate with me, I shall be glad to go further into the matter with him.

W. H. Clegg, A.M.Inst.C.E.I.

Leeds, *February 16th*, 1910.

Electrically-Heated Irons.

In reference to an article in the Electrical Review of February 11th, page 238, *re* flat-irons, a switch as suggested to cut the iron out when not in use, certainly effectually prevents it from over-heating. But there is one thing to be considered when using a flat-iron, namely, that the iron takes a certain time to attain a sufficient temperature for ironing purposes. Therefore, it is very often convenient not to switch the iron off whilst using it intermittently; yet, if left switched on, there is the danger of the iron overheating.

In my opinion, a very simple arrangement would obviate both difficulties.

Let a flat-iron be arranged with two heats, and let these two heats be controlled by the handle of the iron, so that when the iron is standing idle, the smaller heat is in circuit, and when pressure is brought to bear on the handle—as is only natural when ironing—the greater heat is brought into circuit. I designed an arrangement of this kind some time ago, but never put it on the market.

An alternative method which would not necessitate a specially constructed iron, is to have a two-way switch and a resistance mounted near the wall plug which supplies the iron, so that it is possible either to put the resistance in series with the iron, or cut it out.

A. I. Bohringer.

London, W.,
February 21st, 1910.

Greenock Destructor.

Mr. Abraham in his letter in your last issue is in error when he says that I stated that Mr. Robertson was *bête noir* to himself. I only asked the question whether it was Mr. Robertson or the plant under his charge that was the disturbing element.

I am glad, however, to hear from Mr. Abraham himself that the tongue of good report that has spoken in Mr. Robertson's favour has found an attentive ear and appreciative listener in his person. It is pleasing to learn that the seeming animus of his first letter did not proceed from a want of proper good feeling.

Mr. Abraham again shows a want of knowledge of the Greenock destructor when he challenges Mr. Robertson to demonstrate for his benefit an inability to keep steady steam or load without the coal-fired boilers being run parallel with the destructor boilers by shutting down the coal-fired boilers of the station some time during the summer. It is quite impossible to do this at any period of the year, the load at all times being too great to be carried by the destructor alone. As I pointed out in my last letter, the destructor is an adjunct of the electric station, and generates about a third of the total output from destructor steam.

The whole tone of Mr. Abraham's last letter is too inconsequent, and descends to pettiness in its conclusion. The reference to my French Dictionary is quite beside the mark. I have no such book, and no need for it. Neither do I possess the *Electrical Times*, and have little need for it either, although Mr. Abraham sets great store by it.

N. B.

Protection and the Electrical Industry.

It appears to me that in the Electrical Review as elsewhere most of the correspondents discuss the questions of Free Trade and Tariff Reform from a rather parochial point of view. One says, I manufacture meters, and a tax on imported meters would benefit my business; therefore let us have Tariff Reform. Another says, I also manufacture meters, but a tax on imported meters would not benefit me at all, in fact, rather the reverse; therefore Free Trade is the thing.

I think it is practically universally agreed by both Free Traders and Tariff Reformers that our trade in general is not so flourishing as it ought to be. Some of us even believe that whatever change might be brought about could not make things any worse than they have been during the last three or four years. Our trade is not increasing at the same rate as that of some of our principal competitors, nor do we seem to be able to recover from a period of depression so rapidly. The amount of unemployment—already very much larger than it ought to be if trade were in a really healthy condition—does not diminish, and even increases.

The Free Traders do not seem to be able to find any cure for the trouble, but the Tariff Reformers can at least boast that they have a cure to propose. Seeing that Free Trade is apparently failing to ensure the maintenance of our commercial supremacy, what is the objection to trying if Tariff Reform will do more for us? It cannot very well do less.

Your correspondent "Free Trader" contends that it is impossible to keep out manufactured imports by imposing duties. If this be so—and his figures go to prove it—and even supposing the imports increase, does not this remove one of the principal reasons urged against Tariff Reform? I refer to the argument that a tax on imports would reduce the amount of imports, and that, consequently, the amount produced by taxation would not be sufficient to cover the sums required in carrying in the nation's business. Now, nobody but the most rabid Free Trader ever pretended to believe that Tariff Reform would, or could, tax the foreigner to such an extent that England would become a Utopia of no taxes, but, granting that Protection will yield only a portion of the sum required, is there no advantage in the fact that the home manufacturer could be relieved of present—and projected—taxation to that amount, and so enabled to reduce his cost of production and compete with the foreigner on a better footing?

Finally, if the foreigner does not pay the import duties, why are we finding it increasingly difficult to get a footing in protected markets, and why do the protected heathen rage so furiously together at times, and why, oh, *why*, do they rejoice so much over the fact that a Tariff Reform Government was not put into power last month?

Enquirer.

In his letter which appeared in your issue of the 11th inst. Mr. Glendenning mentions one of the objects of Protection to be "to exchange our manufactures for other nations' raw material"; this is exactly what we are doing to a very large extent now under Free Trade, and there is no convincing evidence that this may be very desirable, and would be realised to any greater degree under so-called "Tariff Reform." Protection has certainly not kept manufactured goods out of either Germany or the States. The evidence given before the Payne Committee while the American tariff was under revision is crowded with complaints of the ineffectiveness of the Dingley tariff to keep out competing foreign manufactures, although under that tariff the rates are much higher generally than the most extreme Tariff Reformer here at home has so far ventured publicly to propose. If the higher tariff there has not achieved the object desired by Mr. Glendenning and others, what valid grounds are there for thinking that a lower one would do so here? After all, too, including even partially manufactured articles, many of which are the raw material to our manufacturers, our total imports of manufactured goods represents, I believe, only about some 5 per cent. of the total home production, which surely does not suggest to any unbiased mind that our manufacturers, as a whole, are being ruined by foreign competition. On the other hand, assuming the tariff imposed and that, improbable as it seems, foreign manufactures are entirely kept out, will the consumer be as well off, and if not, is the demand likely to be as great? Universal experience is to the contrary.

Mr. Glendenning asks: which raises capital more readily, a German firm paying at home 13 per cent. or an English one showing a loss? This, of course, requires no answer, but is one supposed to infer therefrom that generally the German firms are paying 13 per cent. and the English firm losing money? In this country last year some £213,000,000 of capital in all was raised—sufficient proof that we are not all working at a loss—and I very much doubt if the same can be said of Germany with its 50 per cent. greater population; if any reader can give me the actual figure I shall be grateful.

With regard to the argument that an increase in price would lessen the demand—by the way, a very common and natural result—Mr. Glendenning suggests that this might be so if only one trade were protected, but as it is to be "Protection all round," he appears to think there is no fear of any such thing. That is to say, if everything is made dearer no one will suffer thereby, but if only a few things were to be dearer some one might. Rather remarkable, eh?

As to the relative amount of labour in equal values of coal and watches, &c., to which Mr. Glendenning refers, I am not sufficiently informed to express any definite opinion, but will merely remark that in a sense the value of coal represents, apart from the royalty, practically nothing but labour. As to the coal tax, which "H. S. H" appears to think injured no one, and which "was not paid by English ships

or shippers to any great extent . . . So that Mr. Kingsbury need not fear for the electrical interests in the North of England . . . . ," let the following extracts from the report (1903) of the Sub-Committee of the North of England Steamship Owners' Association suffice :—

"The statistics of exports of British coal to countries where competition prevails show a large shrinkage in the quantities available to shipowners as cargo. This diminution . . . is caused by an outright transference of trade to foreign coalfields and not by shrinkage of business. The coal tax has undoubtedly acted as a bounty in favour of German coal so far as Holland, Belgium and France are concerned. Some of our English coaling merchants who have offices in Holland are now doing a large business in German bunker coal where formerly they were selling English. Circulars are regularly being received by shipowners in this country from Holland, quoting both English and German bunkers, the latter 1s. per ton cheaper. It seems to your Sub-Committee that the coal tax is actually inflicting injury on the shipping trade, and that shipowners ought to make an earnest and united endeavour to obtain its abolition."

This does not bear out the view expressed by "H. S. H." that the class of coal chiefly exported is "only that people outside this country are bound to have." I cannot speak for either the Midlands or South Wales, but I believe the latter also felt the tax severely. Anyway, as I pointed out in my last letter, the Royal Commission on Coal Supplies unsparingly condemned it, and it was abolished, and, moreover, would have been, according to Mr. J. Chamberlain, even had there been no change in the Government.

"H. S. H." says that Free Traders argue that by manufacturing stuff in this country instead of importing it we shall certainly be hurting our shipping trade, and asks "Why does this not apply to Protectionist countries?" Well, doesn't it? Have not the Americans themselves admitted publicly that their mercantile marine was entirely ruined owing to Protection, and is there any country in the world that can compare with us in the matter of shipping? The cargoes entering and leaving our ports constitute in weight and bulk no less than about one-fifth of the total international seaborne trade of the world. So far as the trade between the United Kingdom and the Colonies is concerned, only 9 per cent. is in the hands of foreigners, and of the inter-Colonial trade 87 per cent. is in our hands. In 1908 we built practically as much tonnage (957,188 against 1,013,932) as all the rest of world put together, and the tonnage of British vessels on Lloyd's register for the year 1908-9 was 17 millions odd, as against 23 millions odd for all other countries. Surely these remarkable figures cannot easily be explained away, and even if other countries do, as "H. S. H." says, "undercut our rates and get some" when "they cannot get enough work for their ships to do," they cannot have done us much harm so far, and apparently we have very little to fear from them, so long as the present *régime* is allowed to continue.

"H. S. H." scorns Mr. Kingsbury's "switch and iron" and "lamp and cotton" comparisons, and regards them not as "concrete cases," but as "the vaguest of Free Trade theories"; I notice, however, that not a single "concrete case" does he himself favour us with—perhaps he will now oblige.

Though with fear and trepidation, in reply to his inquiry, "how can it be assumed that, if the foreigner has a leading start in any particular trade, and has made a big free market for that particular line, Free Trade can catch up?" I venture to mention the motor industry as one example, but I note he "has his answer ready!" As an instance of the power of recuperation under Free Trade, I would mention the South Wales tin-plate industry, which was so badly hit some years ago by the American tariff, but which has since more than recovered its former prosperity—thanks to Free Trade.

Referring to his last paragraph, I think Free Traders are quite as ready as "H. S. H." "to take off their coats" (of scepticism or otherwise) and "get to the practical side of the question in their shirt sleeves." Will he please make the start with some practical "concrete cases"? We may not, however, all have our "answers ready," but will do our best when we know what we have to meet.

Troglodyte.

P.S.—"H. S. H." rather unkindly and prematurely, as I think, remarks that "as might be expected from a Free Trade journal, the Free Trade side is stated in great detail." Well, I hope he is more satisfied now, seeing that you, Sir, with your usual fairness, have practically restored the balance by the insertion in your current issue of nearly six columns on the other side, and, should you favour me by the insertion of this letter, I sincerely trust it will not seriously again disturb the equilibrium in any sense whatever!

[We insert the letters as they come, and, therefore, exercise no control over the relative proportions on either side. But we should not object if correspondents curbed their eloquence somewhat.—Eds. E.R.]

I think that "Free Trader" and "C. E." have made out a fairly good case for Tariff Reform. Replying to "Free Trader," I accept his figures, but I would like to add a few details to them. I am not in possession of the figures for the duty collected on German manufactured imports, but the figures for the United States are very interesting. For 1902 the value of their imported manufactures was 78·9 million pounds, yielding 26·6 million pounds in duty; for 1907 (I have not the 1908 figures) the value of imported manufactures was 132·9 millions, and the yield was 38·4 millions. Taking the increase from 1893 to 1907, we find the imports of manufactures for 1893 were valued at 47·2 millions yielding 19·3 millions in duty; comparing these figures with those already quoted for 1907, we find that, while the value of the imports has nearly trebled, the duty collected has just doubled. This proves that the yield does not increase in proportion to the increased imports, showing that the character of the imports is changing to lesser manufactured goods paying a lower rate of duty, and proving my contention that Tariff Reform has the effect of changing the manufactured imports to imports in a less advanced state of manufacture.

Does "Free Trader" maintain that the exigencies of "international trading" demand that our electrical imports from Germany should be 40 times greater than our exports to her? Must we fight shy of Tariff Reform because France and Italy engaged in a commercial war 20 years ago? Does Tariff Reform necessarily imply tariff wars?

I have not the time nor the necessary data to set out a complete scheme of scientific fiscal reform, and I am sure the Editors of the Electrical Review do not endorse "Free Trader's" request except for insertion at the usual advertisement rates.

Referring to "C. E.," surely if it be natural for the chief buyers of our electrical goods to be those countries who have little or none to sell to us, this axiom should also apply to Germany. Hence, if it be natural for us to export only £2,991 worth of goods to Germany, is it natural for us to import £135,943 worth from her? Nature appears to be a jade as one-sided as fortune is fickle.

Presumably "C. E." buys from his baker, butcher and tailor; would he be quite satisfied if they banged, bolted and barred their doors to exclude his goods? This is the present state of affairs in the electrical trade between this country and Germany.

What does "C. E." think of the recent commercial treaty between Germany and Canada?

E. F. Rendell.

Wallsend-on-Tyne.

It is an amusing touch of human nature that such a stickler for terminological precision as Mr. Low, who gravely lectures us all on the "complete degradation of terms," should wantonly connect my name with the infantile arguments that he thinks I "may be supposed" to use in private life. Besides, it is taking a rather unfair advantage, because none of us is going to undertake the heroic task of endeavouring to discover what Mr. Low's letters "may be supposed" to mean.

I can assure him that when I embark upon syllogistic reasoning, I always take care to provide myself with a full-sized, bevel-edged, copper bottomed middle term, and to

attribute to me by "supposition" that baby's first syllogism touching Protection and employment and the patent law is a "complete degradation" of debate.

Protection is the benevolently intentioned interference of Government for the purpose of supporting and stimulating the trade of a country in competition with other countries. To grant public money for encouraging the growth of cotton in British Dominions is Protection for Lancashire, and is heartily approved by that Free Trade county. To insist that a patented article shall be manufactured here instead of in Germany is also Protection, and under the shelter of this measure passed by a Free Trade Government, a number of factories have been erected. Ought not a devout Cobdenite to claim that that patented article should be left free to find its natural home of manufacture. To divert the product of taxation to the construction of light railways and other "development" in rural districts is Protection for agriculture, and that none the less because it is promised by a Free Trade Cabinet. Again, for a municipal government to decide that it will accept British tenders, even when they are higher than foreign, is Protection, although casual and voluntary, and although it may be exercised by a Council composed chiefly of Free Traders.

That brings us to the point. Will Mr. Low tell us whether, when the Glasgow Corporation is about to buy £10,000 worth of generating plant, or £1,000 worth of lifting tackle, it ought to pass over a foreign tender 3 or 4 per cent. below the British firms, and, if so, Why?

Let us make this a test case. I do not care to bandy Board of Trade returns with your long-winded correspondents; nor do I care to aviate in the abstract. Let Mr. Low and the others come down to earth. It must be rather cold and damp up there, and it is becoming more and more lonely.

T. C. Elder.

P.S.—To exclude side issues, I put in a postscript another protest against the want of precision in Mr. Low's controversial methods. When I say, "I don't care much whether it is bounties or duties we have *for a start*," he jumps off from my "indifference" to the assumption that I do not believe that the foreigner would pay import duties. That strikes me as rather effeminate logic. The correct inference from my statement is that revenue from Customs duties is of secondary importance. My belief is not necessary. It is a fact that import duties are paid by the foreigner in many cases, depending on the size of the duty, the state of the market, the nature of the commodity. If the consumer always paid we could raise a thumping revenue by taxing our exports.

Your correspondent "C. E." makes such an extraordinary statement in your issue of the 18th inst. that I am bound to answer it, although the figures he gives are so obviously misleading that I trust the majority of your readers will see through his thinly-veiled attempt to traduce my statements.

First of all, as you know, my offer to you in my letter of the 11th inst. was not in the nature of a bet. My profits are not abnormal, and the example he takes is not a typical one.

I should like to know how many 100-H.P. motors are shipped to the countries he names every year. I should say that hardly one is at present being shipped to those countries. His figure of 3½ tons as the weight of this machine is very wide of the mark. The average weight given by the best makers is 2½ tons. Taking this as a basis, which is the correct one, we have the following figures:—

On 100-*H.P. Motor costing* £156 *and weighing* 2½ *tons* = *say*, 2,500 *kilos.*

German import duty, 6 marks o/ 100 kilos = £7 10s., or 5 per cent. on value, as against 25 per cent. stated by "C. E.," and 4 per cent. by me, as being the duty on my goods.

French import duty, 20 to 30 francs o/ 100 kilos = £20/30, or 12-19 per cent. on value, as against 10 per cent. by me.

American import duty, 45 per cent. on value, as against 73 per cent. by "C. E."

Russian import duty, 13s. 10d. per cwt. = £34 11s. 8d., or 22 per cent., as against 131 per cent. stated by "C. E." and 8 per cent. by me.

I may state, for "C. E.'s" information, that my manufactures are not at all mysterious. "C. E." has taken as an example a piece of machinery which is taxed according to its value at a much higher rate than the majority of electrical apparatus, &c., which would form the bulk of the exports to these countries, and it would be found that the import duties in Germany, France and Russia, would work out at a much lower percentage of the value than on continuous-current motors, which form an infinitesimal portion of the English exports to these countries.

I still maintain that 2 or 3 per cent. is not a manufacturer's net profit, and would not be considered so by the majority of English manufacturers, or, indeed, of any manufacturer of electrical apparatus. I am not inclined to make a dissertation on the general question of Tariff Reform, but have thought fit to bring to your notice a few facts with which I am intimately acquainted.

Ex-communicated.

February 22nd, 1910.

Dealing first with Mr. Low's reply to myself, I do not accept his analysis of any kind of benefits to protected industry; that is why I raised various points in my last letter. These points were definitely and purposely primary, and as Mr. Low does not answer them, I can only continue to ignore the ultimate reactions.

I do already eat, drink and wear gold in the widest sense of the word, and I am amused at Mr. Low catching at this, the most theoretical point raised in my letter.

I am not quite a beginner in economics, and in other branches of science that I have studied any understanding arrived at between two opponents in argument usually has to find its way back to certain primary facts that can be stated in terms of common sense.

Why is it that when business men want the elements of economic science stated in a common-sense manner, that all we get is talk about debased currency and coinage, and references to a Birmingham mint. This is not argument, nor if we are in need of it, instruction. It does not much matter whether some economists find the intercourse profitable or not, so long as the total result is to the benefit of the nation. Cobden's ghost is much more likely to be disturbed by the absolutely hide-bound prejudice of his so-called followers, than by any statement as to his theories not being applicable to these present times.

After Mr. Low's letter this week, he can scarcely be expected to reply to explain business questions, but I will state it all the same. Is it better for any country that a patented article must be manufactured in the country where the patent is published, or that the publication of that patent establishes its monopoly in any country of publication, irrespective of where it is made?

The publication of a patent in this country now compels manufacture here, to retain the monopoly. It usually means the increased use of skilled or other labour in the manufacture of the monopoly and possibly the training of what was unskilled into skilled labour. Yet if this be called protection of, or help for, Home Labour Interests by an open-minded business man, he is, from Mr. Low's point of view, using debased economic terms.

What we business men want from Mr. Low and other Free Traders are plain, practical answers to straightforward questions, and we do not get them.

If these Free Traders fear so much for the future of this country under Protection, let them not shirk their plain duty, but answer question by question, not by smart rejoinders nor by economic hypothesis, but in the language the questions are asked, and they and the Press, whose space is placed at the disposal of the argument, no matter what the result, will earn the certain gratitude of the people of the country.

H. S. H.

National Electrical Manufacturers' Association (Inc.).—The next Committee meeting of this Association will be held at Balfour House, E.C., on Tuesday, March 8th, 1910, at 2.30 p.m.

THE "ELBACAR" ACCUMULATOR.

A new storage cell is being brought out under the name of "Elbacar," by Electric Batteries and Carbons, Ltd. The cell is the invention of Mr. Lothar Fiedler, who was also associated with another in the invention of a battery described in our pages some four years ago. The plates are of the pasted interlocking grid type, the paste being hardened by a special chemical process and put in under great pressure; although very hard, the active material is also very porous, and a high efficiency is claimed for the battery. Freedom from sulphating, buckling, and formation of mud, are other claims on behalf of the new plate, which also can be formed in a very short time—24 hours; high rates of charge and discharge can be employed without damage to the plates, which, being exceptionally light, are well adapted to traction purposes.

The cells, we understand, were in fact specially designed for use in cabs and commercial vehicles; a battery suitable for the former weighs about 7 cwt., and the plates cost 5·2d. each, so that with a life of 1,200 miles the cost of the plates works out, we are informed, at 0·585d. per mile. A heavy touring car weighing 2 tons with a battery of 46 Elbacar cells of 25 plates each has run 1,200 miles successfully, the battery holding a charge capable of driving the car 50 miles; during the run the battery underwent several capacity tests, and 80 discharges at the rate of 50 amperes. We have inspected some plates from this battery, which appear still to be in excellent condition. A test of this car conducted by Faraday House showed the following results:—

Miles run, 38·8; time, 3 hours 24 minutes; output of battery, 10,350 watt-hours; watt-hours per ton-mile, 116·7. The current varied between 10 and 99 amperes. After the run, a further discharge at 50 amperes was taken, until the P.D. had fallen to 80 volts, the output being 3,040 watt-hours. Three cells of this battery were charged at 30 amperes and discharged to 1·75 volts at 50 amperes at Faraday House, and the average result was an ampere-hour efficiency of 91·2 per cent., watt-hour efficiency 80·8 per cent., the output being 266 watt-hours. Each cell contained 25 plates, and weighed 43 lb. 1 oz.

Mr. Henry Crookes, M.I.E.E., has also tested the cells under various conditions, and finds that the average ampere-hour efficiency is 94·1 per cent., watt-hour efficiency 82·1 per cent., and the watt-hours per lb. 6·5.

We are unable to account for the apparently low output of the battery in watt-hours per pound of complete cell; this is about 6 or 7, whereas from 12 to 15 is a normal figure, which has been obtained by many types of cell. While testing the Elbacar cell, Mr. Henry Crookes also tested two well-known makes of similar size, and obtained still lower values in watt-hours per pound; and this increases the mystery. As regards the merits of the Elbacar cell, we express no opinion—as we have pointed out in previous cases, a long period of actual running on the road is the only test of a traction battery worth looking at. We understand that the Elbacar cells will be used for the equipment of a large number of electric cabs in London, and we cordially welcome this renewed attempt to popularise the electrical vehicle.

A Fiscal Fable (from a caustic correspondent).—There was once a man named Smith, a man named Brown, and eke a man named Robinson, all makers of electrical gear, and skilled players of the game called Trade. And as they were disporting them right lustily amid their friends, came two others, strangers, asking that they might join the merry throng. Men of distant lands were they, as their names betokened. For the one was Cyrus K. Hustler, and the other Herr Schwarzesbrod. Now, Smith thought that the strangers should be admitted Freely. And he said so. Whereas Brown thought they should Pay for joining the Sport. And *he* said so. Smith said the more there were the bigger the Game. Which Brown proved to be but folly. He said the more that was paid the bigger the stakes. Which Smith proved was empty talking. He wondered hugely that a man should be so ignorant; and Brown declared the other needed education. Thereupon they held much speech with their friends, and their words were many and strong. And they and their friends wrote to the Press, all one against the other. So that their anger rose mightily, and the Game was nigh forgotten. Now while these things were doing, Robinson, a silent man, marvelled at the clamour. But naught said he, till presently, seeing that the others had made of Politics their business, he quietly swept up the Stakes. For Robinson made business *his* politics.—H.R.T.

REVIEWS.

Munro & Jamieson's Pocket-Book of Electrical Rules and Tables. Nineteenth Edition. London: Chas. Griffin and Co. Price 8s. 6d.

This, the *doyen* of electrical pocket-books, is one of those works which are classed as fundamental necessities to the electrical engineer; it, therefore, needs no recommendation, and no general review of its contents—for which we are truly thankful, for to peruse the whole of its contents is a task which we would far rather leave to Prof. Jamieson, who, we believe, was originally responsible for the greater part of the work, and has for many years carried out the whole of the work of revision and addition. We note that even his indefatigable industry hardly suffices to cope with the task, for in the preface he acknowledges his indebtedness to several of his old students and other engineers; with their aid over 100 pages of the previous edition have been deleted and 132 pages of new matter inserted, and the publishers, at his request, have repaged and rearranged the latter half of the book, so as to eliminate most of the suffixed page numbers. There are in all 860 pages.

The progress of modern electrical engineering is so rapid, that it is very difficult to keep such a work as this up to date; many of the old tests, tables and formulæ, of course, will remain as useful as ever for ever, but new methods of testing are constantly being introduced, and in such matters as electrical design progress is unceasing. Hence we find that a new article on the "Designing of Dynamos and Motors" has been contributed by Mr. W. B. Hird, dealing mainly with D.C. machines. Seeking a corresponding section on A.C. machines, we find a notable deficiency—there is very little on this subject. The proofs might have received a little more attention—Winter-Eischenberg (page 496), Pheripheral Speed (page 481), draft (page 482), mils. for mils (various pages) are amongst the errors we have noticed, the last being particularly objectionable, as it may be read to mean millimetres. There is no mention of commutating poles.

Turning to the section on Electric Lighting, which has been revised and extended by Mr. J. D. Mackenzie, we find this very well and clearly arranged, the part dealing with Illumination being very lucid and up to date, though at the time when the edition went to press, the international adjustment of light standards had not been announced, and thus the hefner is given as 0·913 C.P. instead of 0·9. The metallic-filament lamp is described briefly, but is not to be found in the index under any of its many names, and we find that this section has not been adequately indexed at all—a pity, as the index of "M. & J.," we believe, has always been regarded as one of its strong points. A par on p. 555 is obviously out of place, and on p. 557 the word "angles" occurs for "values" (coefficient of reflection).

A number of codes of rules—the I.E.E. wiring rules, Lloyd's rules, &c.—have been included in this edition, quite rightly, as they are very necessary to men engaged in practical work. The changes made are certainly improvements, and will increase the usefulness of the book.

Prize Competition.—H.M. Consul at Naples reports that the Italian Minister of Agriculture, Industry and Commerce has announced five competitions, of which the following is of interest to electrical men:—For a theoretical and experimental design to "earth" industrial electric plants. In the scheme particular attention must be paid to (*a*) the phenomena which occur when any point of an electric circuit touches the floor; (*b*) the influence of the nature and composition of the floor on these phenomena; (*c*) the influence of the form of currents and of their pressures on the phenomena; (*d*) the efficiency of the "earths"; (*e*) the means of maintaining and testing the "earths." The prize will be 10,000 lire (about £400), and the competition will close on December 31st, 1911.—*Board of Trade Journal.*

The Harry Cox Fund.—The *Daily Telegraph* announced on Monday last that this fund had reached £1,944. Sir Wm. Treloar's original object was to raise £2,000, but it has been thought that a further £500 should be raised in order to ensure a fair income for Mr. Cox from the interest upon the investment.

LEGAL.

THE "Z" ELECTRIC LAMP MANUFACTURING CO., LTD., *v.* MARPLES, LEACH & CO., LTD.

(Continued from page 220.)

MR. SWINBURNE, on the hearing being resumed, was further cross-examined, and said that he should have thought the quantity of carbon mentioned ($\frac{1}{1000}$th part of a milligramme) was too small to have blackened the lamp or to have affected it in any way, but on the other hand, as he had pointed out, the plaintiffs' lamps were made the same way as the defendants', and the lamps made without phospham did blacken, while those made with phospham did not. The whole of the plaintiffs' specification was governed by the statement that in the manufacture of incandescent electric lamps with metallic filaments it was desirable to obtain the finished filament as free from carbon as possible. He knew that phospham began to give off gases almost immediately one began to heat it in a vacuum.

COUNSEL suggested that real phospham did not give off any gas until it reached a temperature of about 800°, and it lost no weight whatever.—WITNESS said that if that was so, it would be no use in a lamp whatever.

COUNSEL said that was what he suggested.—WITNESS: I thought you used it.

COUNSEL: I dare say, but for another purpose altogether.—WITNESS: It cannot be for any purpose if it does not do anything. Witness agreed that if what counsel said about it was true, it did not do what the specification claimed it did, but he did not agree with what had been said about it. Reading the specification, he understood that nitrogen was released.

MR. JUSTICE PARKER said that the specification was evidently directed to a lampmaker, and if by the directions they were led to use something that was not phospham in the absolutely strict chemical sense, but something else, or phospham combined with something else, it might be sufficient.

MR. TERRELL agreed. Another part of his case which he should have to come to was, what was the knowledge at the time, and what anybody would have thought was phospham.

WITNESS, further questioned, agreed that whatever its composition was phospham was a light powder something like magnesia. Questioned as to the amount of phospham required to remove the carbon from a filament, witness said that in the experiment he tried he used 14 grammes of tungsten, ·42 gramme of phospham to ·7 gramme of tar.

COUNSEL said he was going to produce evidence that with such a proportion of phospham it was absolutely impossible to make a filament a ¼ in. long.

Re-examined, WITNESS said that the experiments put to him in cross-examination had been apparently made throughout with Kahlbaum phospham. Substantially his experiments had been made with Schuchardt phospham or Pauli phospham. Kahlbaum phospham and Schuchardt phospham appeared from experiments to be different.

MR. HORATIO BALLANTYNE, examined by MR. WALTER, said that the correct formula for phospham was PN_2H. He had no difficulty in making it. With every kind of phospham he found it a body which, at a comparatively low temperature, decomposed giving off nitrogen in the form of ammonia. He had made lamp filaments by all the processes described in the specification. In preparing metallic filaments intimate grinding of the metallic particles with the binder was an important thing. All his tests on the percentage of carbon were made with Schuchardt's phospham. He had been told how the defendants made their lamps, but he, personally, knew nothing about it. He had made experiments in accordance with what he had been told. Mr. Ballantyne further said that he had made filaments, made with Kahlbaum's phospham, up into lamps. The lamps after running and being broken, smelt of phosphorus. Witness produced a number of lamps he had made, some few of which showed a slight blackening, but the majority were free from any sign of blackening. One of the lamps was fixed to the electric light beside the judge and run for some considerable time. He also, he said, took 12 of the lamps that were alleged to be infringements, scrapped off all the residue of the glass rod, which was of a softer character than Kahlbaum phospham. From the experiments he made he found the stuff on the infringing lamps was not Kahlbaum phospham, but phospham and red phosphorus. Without phospham, if the finger was placed in the bell during the process of flashing, there was enough carbon to blacken it. He had not seen the blackening of the finger where phospham was used. In the process of lamp manufacture, the gas was drawn over phosphorus pentoxide, so that the whole atmosphere would remain dry inside the tubes. He knew of no case in lamp manufacture in which some hygroscopic body like phosphorus pentoxide was not used in order to absorb the water. So far as he knew, phospham was not advertised for sale by Kahlbaum, either in 1906, 1907 or 1908. He had frequently observed that if the filaments had not been adequately sintered, so that the carbon was not sufficiently driven out, the lamps made in that way were very apt to break either during oxidation or during use. What took place apparently was that the current got a path through what seemed to him to be carbonaceous particles of some sort given off by the filament, and could jump from one filament to another by a short circuit, so that the lamp broke. It was very common, and such a lamp would, of course, blacken. In the course of experiments that he saw made at the "Z" Electric Lamp Co.'s works about a year ago, they used a carbonaceous paste for fixing the hair pins into the conducting tubes, and they frequently saw across the little star-shaped region where the paste was, the flashing across and breaking of the lamps. It seemed to be localised by the carbonaceous matter. It short-circuited at the bottom and cracked at the foot. He was satisfied from experiments that he made that carbon had that effect on the lamp. Carbon did it, although the actual blackening on the globe was tungsten.

Cross-examined by MR. TERRELL, WITNESS said that he thought outside one or two German makers there were no makers or any market for phospham in England prior to 1906 for any industrial purpose whatever. They got their chemicals from German makers, as a rule. He agreed that phospham was a different thing to phosphamide. As he read it, the point in the plaintiffs' specification was the removal of carbon. They did not require to remove the carbon absolutely in order to get the result.

COUNSEL suggested that it did not matter so long as they got the carbon below 0·2 per cent.—WITNESS said he could not give the figure because he had found good results with even more. He had found lamps made from filaments containing 0·26 per cent. of carbon give good results.

MR. TERRELL: What you have to get rid of is the phosphorus vapour in the lamp, and it does not matter a button about the carbon?—I do not agree with that.

Do you, or do you not, agree that if you have phosphorus vapour in a lamp, it makes a substantial difference?—It makes a difference in the vacuum clearly.

Do you mind putting into words exactly what the invention here is?—The invention, as I consider it, consists in the use of phospham for the purpose of freeing the filaments from that which the lamp makers recognise from its effects as being carbon. What the chemical reactions are I cannot say.

What is the deposit in the bulbs that is supposed to be carbon?—It was supposed to be tungsten.

WITNESS, continuing, said that when he wanted to find out whether a thing was metal or carbon, he now treated it with chlorine. It occurred to him the first time he saw it that the blackening was tungsten, and not carbon. That would be about October, 1908. He did not know now that there was no carbon in it. That was his trouble.

(To be continued.)

CONSOLIDATED TIN AND COPPER MINES *v.* CROMPTON & CO., LTD.

In the King's Bench Divisional Court, last week, Justices Phillimore and Bucknill had before them this case, which was a motion by Messrs. Crompton & Co. to set aside a judgment of the Official Referee.

Mr. Abel Thomas, K.C., and Mr. John Sankey, K.C., appeared for Messrs. Crompton & Co., and Mr. A. C. Russell, K.C., and Mr. Schiller represented the Consolidated Mines.

In opening the appeal, MR. ABEL THOMAS explained the circumstances of the case (see ELECTRICAL REVIEW, 1909). The Referee gave an award against defendants for the sum of £2,900. There were, said counsel, five questions at issue in the appeal. His clients said that they were to erect a pumping plant capable of raising one thousand gallons a minute to a total head, including friction, of 120 ft. Undoubtedly that was the contract; it was what was stipulated for, and no amendment was ever asked for. Despite that it was in writing, the learned Referee found, as a matter of fact, that that was not the contract between the parties. He came to the conclusion that plaintiffs expected to have a pumping plant which was capable of raising water from a depth of 120 ft. Mr. Muir Mackenzie found that the defendants did not carry out their contract in this respect, and awarded £100 damages against them on that head. The next point had reference to what was called liquidated damages or a penalty, and on that head the Referee allowed such damages to the amount of £2,400. On the third question the Official Referee found that the plaintiffs failed to provide an essential part of the goods which they were to supply; that they failed to supply on July 24th, when the defendants were ready to begin and did not get that essential part until August 18th. Counsel contended that there was no liquidated damages to be obtained from defendants prior to July 24th. The next question was whether the delay was due to something beyond the control of the defendants, and upon that the Official Referee found that though there was a strike in Germany where the machinery was to have come from, the defendants could have made the machinery themselves. Finally, they said that the plaintiffs never gave the machinery a chance, and therefore on those grounds the defendants were entitled to judgment. Having read the judgment of the Official Referee, Mr. Abel Thomas went through the evidence to prove his contention that their contract was not the contract upon which the Official Referee had found, and he also argued that the liquidated damages were excessive.

MR. RUSSELL, K.C., for the respondents, contended that the main issue was the question of damages. The question here was whether there was a breach of contract, and, if so, what amount of damages were the respondents entitled to in respect of the breach. His submission was that there was a clear breach of contract by the defendants, because they undertook to deliver the machinery by May 24th, and did not do so. That being a breach, the only question was the amount, and counsel contended that the finding of the Official Referee on that head was right and proper, and should stand.

After further legal argument, the Court delivered judgment.

MR. JUSTICE PHILLIMORE said that this was a very complicated and lengthy matter. On the first head, as to the delivery of the pump, he came to the conclusion that the finding of the Official

Referee in favour of the plaintiffs for £100 was right, and must be confirmed. The Court also affirmed the remaining minor items. The main point in the case, continued his Lordship, was the liquidated damages awarded by the Official Referee, and amounting to £2,400. This part of the case raised considerable difficulty. They came to the conclusion that the Official Referee was right in the award of liquidated damages up to July 24th, but not after that date. They therefore directed that the order of the Official Referee be varied by the order of the Court that no liquidated damages be awarded from August 18th to October 19th, but that it be referred to the Official Referee to ascertain the damages due to the plaintiffs on the ground of delay during that period.

Mr. Justice Bucknill concurred.

Mr. Abel Thomas said the judgment amounted to this: that they had successfully attacked some £1,400 of the Official Referee's award.

The Court held that the plaintiffs would have the costs before the Official Referee, and the applicants should have two-thirds of the costs of the appeal.

Curious Tramway Dispute.

In the King's Bench Division during the week, before Mr. Justice Pickford and a common jury, a somewhat interesting action in regard to the liability of tramway companies was heard. A Mr. Chas. Medley, partner in a firm of wheelwrights, carrying on business at Church Road, Acton, sued the London United Tramways, Ltd., and the London General Omnibus Co., Ltd., to recover damages for personal injuries received, he alleged, owing to defendants' negligence.

Mr. M'Call, K.C., with Mr. Warren, appeared for plaintiff; and Mr. Roskill, K.C., and Mr. Pike Glasgow were counsel for the tramway company; Mr. Saunderson, K.C., and Mr. E. Charles, represented the omnibus company.

Mr. M'Call stated that the proceedings were the outcome of an accident which occurred in the High Street, Acton. Plaintiff alleged that both the companies were liable, but the tramway company declared that the accident happened owing to the negligence of the omnibus company, and the omnibus company said the tramway company were liable, because they were negligent in allowing their lines to get into an unfit condition. On the day of the accident plaintiff was riding along High Street, Acton, in one of the defendants' motor-buses, and on arriving at the corner of the thoroughfare, by the market place, he stepped out on to the platform of the 'bus and prepared to descend. Suddenly he felt a wrench, and the rear wheel of the 'bus, which was the driving wheel, came off, ran back, and fell against plaintiff's leg, severely injuring him. He was confined to his bed for nine weeks, and afterwards had to go away for a change. Under their statutory obligations, said Mr. M'Call, the tramway company were bound to maintain the tramlines in good order, but he alleged they had allowed the wooden blocks to subside on the track, leaving the lines in such a condition that it would be very dangerous for any wheels which might catch in them. The tramway company had had notice several days before of the dangerous state of this part of the tramway line, and a few days afterwards they had a portion of it repaired. As to the omnibus company, counsel said that if the 'bus had been properly examined, the accident would not have happened. The wheel could only have come off by reason of the collet being worn and allowing the wheel to slip off the axle.

Evidence was called on behalf of plaintiff, a witness testifying as to seeing the wheel come off the 'bus and to a depression at the intersection of the tramlines.

At the close of plaintiff's case, Mr. Pike Glasgow submitted that there was no evidence against the tramway company as to the condition of the rails being responsible for the accident.

His Lordship, however, expressed the opinion that there was evidence to go to the jury, but said he would take note of Mr. Glasgow's point.

Mr. Glasgow, on behalf of the tramway company, pointed out that although the accident happened in November, it was not until December 18th that it crossed the minds of plaintiff's advisers to make any claim against the company. Evidence was forthcoming that the wheel of the 'bus was wobbling for a distance of some 72 ft. before the accident happened. If it had met with an obstacle on the line, as was suggested by plaintiff, it would have required a pressure of 30,000 lb. to bring the wheel off, and it was absurd to suppose that there had been any such pressure. If there had been it would have caused a jerk which would have thrown plaintiff into the road and probably killed him.

Evidence was then called, and the hearing adjourned.

(To be continued.)

Measures Brothers, Ltd.

In the Chancery Division last week, Mr. Justice Neville had before him the affairs of Measures Bros., Ltd., in a motion for judgment by Gilbert and another against the company.

This was a debenture-holder's action, and the plaintiffs were the trustees for the debenture-holders. The company was in liquidation, and the security, therefore, became enforceable.

His Lordship made the order.

PARLIAMENTARY.

Petitions against Private Bills.—Petitions have been deposited in the Private Bill Office of the House of Commons against Bills which have clauses dealing with electrical matters:—Southampton Corporation; Chipping Norton Gas and Electricity; London County Council (Tramways and Improvements); Bradford Corporation; Devonport and District Tramways; Middleton Corporation; North and South Shields Electric Railway; Rhondda Urban District (Tramways Extension).

Petitions have also been deposited in the Private Bill Office of the House of Lords against the following Bills originating in that House:—Baker Street and Waterloo Railway; Bishops Stortford, Harlow and Epping Gas and Electricity; Farnham Gas and Electricity; Handsworth U.D.C.; London United Tramways; Metropolitan District Railway; Metropolitan Railway; North-East London Railway; Nottingham Corporation; Reading and District Electric Supply; Wimbledon and Sutton Railway; Charing Cross, Euston and Hampstead Railway; London Electric Railway Amalgamation.

Hastings Corporation Bill.—As there was no appearance of parties when this Bill came before the Examiners it has been struck out of the list. Amongst the powers included in the Bill were those for the compulsory purchase of the site of the generating station and clauses in regard to electric fittings.

Standing Orders.—On Wednesday, February 16th, the London County Council Tramways and Improvements Bill came before the Examiners (Messrs. Jeune and Campion) of the House of Commons for proofs as to compliance with Standing Orders. Mr. Pritt, Parliamentary agent for the Council, explained that as to the opposition of the Borough Councils of Hampstead and Marylebone alleging non-compliance, the promoters did not intend to proceed with the reconstruction or construction of tramways within the area of those local authorities. The Council further had withdrawn the proposals relating to the reconstruction or construction of tramways in Paddington, Kensington, Islington and St. Pancras. Formal evidence having been given, the Examiners found the Bill to comply with the Standing Orders and ordered the Bill, as amended, to proceed.

Seeing by Wire, and Electricity from Trees.—Our artless contemporary, the *Daily Mail*, is still absorbed in electrical problems, and has ever some new thing to bring forward. Last week "something more tangible than television" was unearthed, the invention of M. Edouard Belin—an apparatus by which a series of photographs can be "telegraphed one after the other instantaneously," and reformed so as to give a cinematograph reproduction of an event at any distance.

We are informed that M. Belin's paper records consist of innumerable perforations in a sheet of paper, each hole of a certain size and corresponding to the dots of a half-tone photograph. This is laid on a metal base and drawn along under a set of metal brushes, and so on; detailed description is needless, though our contemporary appears to have plenty of room to spare for these "visions."

In another article, contributed by "Our Scientific Correspondent," the *Mail* describes the "wonderful results of scientist's experiments." By connecting plates of copper to a tree and to earth, with a galvanometer in circuit, M. Commelin, another French inventor, has discovered that electric currents flow between them, in amount proportional to the number of trees. Our thoughts stray to similar phenomena in connection with the old-fashioned ways of wiring. But M. Commelin goes further; by means of the earth currents derived from two plates of copper in the earth about a yard apart, he succeeded in depositing 25 milligrams of copper in an electroplating tank in the course of 408 hours. From this it is argued that, with larger plates, more powerful currents might be obtained, which could be put to some practical use.

We wonder whether these items were intended for Messrs. Harmsworth's Children's Encyclopædia, but were rejected by the editor of that publication as being unworthy of insertion therein.

Foreign Markets.—Discussing the over-sea trade of Sweden, *Affärsvärlden* states that Argentina stands first among its foreign markets; the Swedish exports to that country show the most rapid increase in recent years, and include, besides iron and wood manufactures, electrical and other machinery. In Brazil a Swedish trading house has been established, and the Stockholm Chamber of Commerce has sent a commissioner out to study local requirements. The example of Sweden points the way to British exporters, though it should hardly be needed, after what we have already said regarding the immense possibilities of South American markets.

American Battery Plant Burned.—The Westinghouse Storage Battery Co.'s plant at Boonton, N.J., was burned down on February 6th, causing a loss of £48,000. Only the power house was saved. A Chicago exchange says that the plant had only recently been purchased from the General Storage Battery Co.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Amalgaline.

A process invented by Mr. Harden is being introduced by the Metal Jointing Co., Ltd., of Adelphi House, 71 and 72, Strand, W.C., and seems likely to prove of very great utility to electrical engineers. It consists in a method of jointing lead without the use of wiped joints, and bids fair to supersede the latter altogether

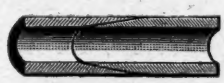
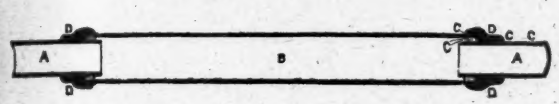


Fig. 1.—Straight Joint in Pipe.

for plumbing work of all kinds. It involves the use of a simple "device" which justifies its description in this column—a strip of pure tinfoil, smeared with a patent flux called "Amalgaline," which prevents its oxidation. The surfaces to be joined are cleaned, and a strip of "Amalgaline" is placed between them; heat is then applied sufficient to melt the strip, when the surfaces of the lead fuse and become coherent. As the foil melts at a much lower temperature than the lead, and lowers the melting-point of the surfaces with which it alloys, the complete union of the surfaces is effected at a temperature well below the melting-point of the

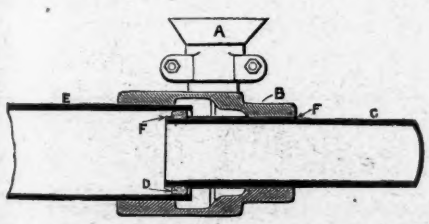


A, Cable; B, Sleeve; C, Amalgaline; D, D, Cast lead.

Fig. 2.—Post Office Standard Joint in Telephone Cable.

lead; the joint occupies no space, contrasting with the usual plumbed joint, and is at least as strong as the rest of the structure.

In jointing pipes, the ends are coned male and female with a simple patent cutter, put together as shown (fig. 1), with "Amalgaline" between, and heated with a blow-lamp, or with a hot pair of clamps, and the thing is done. Tests carried out by the Metropolitan Water Board show the enormous strength of the joint thus made, and the Board has approved the process for use in the area under its control. The cost of the joint is, of course, reduced from



A, Hopper; B, Mould; C, Cable; D, Packing; E, Sleeve; F, Amalgaline.

Fig. 3.—Detail of Joint.

a matter of shillings to as many pence. All kinds of lead pipe work, of whatever size, can be dealt with by this method, and lead boxes and tanks can be built up in a very short time. Brass and copper can also be joined to lead, and zinc sheets joined, on this method.

Its bearing on electrical work is shown by the accompanying figures. The Post Office has adopted the process, we are informed, for joints in underground telephone cables, which are less easily handled than the more solid lighting and power cables. The sleeve

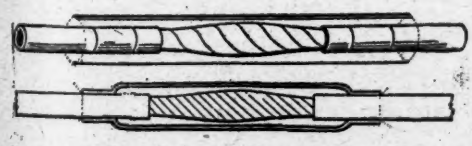
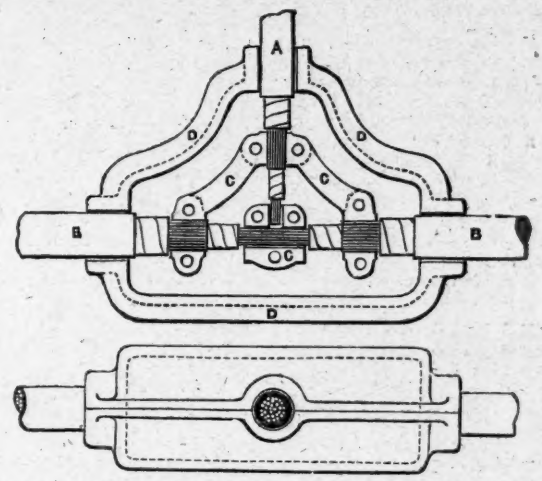


Fig. 4.—Joint in Heavy Cable.

drawn over the finished joint is not dressed down over the cable sheathing at all; "Amalgaline" is placed on the surfaces, cast-iron moulds are applied as shown in fig. 3, and molten lead is poured in, producing a complete joint at once, ordinary engine packing being used to prevent the lead from flowing into the cable. The system is both effectual and speedy—an important point when dealing with hygroscopic cables. Power cables are plumbed as illustrated in fig. 4; the lead sleeve is dressed down, with "Amalgaline" between the surfaces, and a gentle heat applied. Mr. A. J. Fuller has been using the system since 1907 on his cables in the borough of Fulham, and states that a saving of over two hours of plumber's and mate's time is effected by it, while the joints are better made; not one joint has failed.

Other illustrations show a leaden service-box, the halves of which



A, Service cable; B, Distributor; C, Connecting links; D, Flange of box, upon which Amalgaline is placed.

Fig. 5.—Leaden Service Box.

are joined to the cable sheathing and to one another with "Amalgaline," giving perfect bonding of one metal only, so that electrolysis is avoided, and the box, which occupies the minimum of space, is absolutely watertight. We have inspected a large number of specimens of work done on this system, and believe it will be found a great advance over existing methods.

Crypto Motor-Generator.

The Crypto Electrical Co., of 155, Bermondsey Street, S.E., having found their 100-watt A.C.-D.C. transformer successful, have brought out a larger machine on the same lines, having an output of 350 to 400 watts, according to the frequency. The winding of

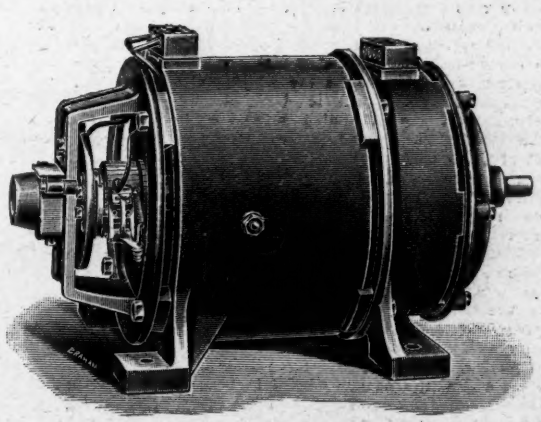


Fig. 6.—Crypto 400-watt Motor-Generator.

each half of the machine is entirely separate, so that the output on the D.C. side can be controlled by a resistance in the shunt field. There are only two bearings and no coupling, so that the dimensions and weight of the machine are very moderate for the output. The appearance of the machine is shown in the accompanying illustration, fig. 6.

Alleged Theft of Electric Lamps.—At Hyde Police Court on Monday, James Gilder, an electric light wireman, of Manchester, and Fredk. Jackson, of Hyde, were charged with stealing 30 electric lamps, value £3 19s. 9d., from Gee Cross, the property of the executors of Mr. Thos. Bechey. It was stated that the lamps were installed in a house at Gee Cross, and on January 26th, while it was untenanted, 30 of the lamps were missed. The electrician who installed the lamps identified them in Court; 18 of the lamps had been sold to Mr. Broadbent, of the Snipe Inn, Anderstow, who became suspicious and informed the police. Gilder said he sold the lamps for Jackson, but admitted receiving half the money. Both prisoners were committed to the Knutsford Sessions.

F

THE I.E.E. AND THE ELECTRICAL INDUSTRY.

Mr. E. Garcke has forwarded to us copies of the following further correspondence between the Institution and himself on the above subject:—

[copy.]

92, Victoria Street,
London, S.W.
February 18th, 1910.

E. Garcke, Esq.,
Electrical Federation Offices,
Kingsway, W.C.

Dear Sir,—Your letter of February 3rd has been considered by the Council, and I am instructed to inform you that while the Council, as pointed out in my letter of January 28th, will continue to do all in their power to promote the general advancement of electrical science and its applications, they are of opinion that it is not within the proper scope of the Institution to provide the special organisation suggested by you at the end of your letter.

I am, yours faithfully,
(Signed) P. F. Rowell,
Secretary, I.E.E.

[copy.]

February 22nd, 1910.

Dear Sir,—I am in receipt of your esteemed letter of the 18th inst., and I note the decision of the Council.

I am, yours faithfully,
(Signed) E. Garcke.

P. F. Rowell, Esq., *Secretary*,
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BUSINESS NOTES.

Book Notices.—*Geschichte der Telegraphie.* By Th. Karrass. Vol. IV of Telegraphie und Fernsprech-Technik. Brunswick: Fried. Vieweg & Sohn. Price M. 28.—This forms the first part of a monumental work on the history of telegraphy and telephony, by one of the leading German telegraph engineers. The comprehensive nature of the treatment will be appreciated when it is stated that the present volume, with its 702 pages and 618 illustrations, only carries the subject up to the threshold of multiplex telegraphy, thus leaving considerable branches of modern telegraphy still to be handled in the second volume. The method adopted throughout is a happy combination of the popular and the scientifically correct, such as is well suited to an historical treatise. The numerous and excellent illustrations are carefully described and give a thorough insight into the mode of operation and the way in which the later forms of apparatus have been developed from the earlier ones. The present volume is divided into seven sections, dealing respectively with—(1) non-electrical telegraphy (mechanical, hydraulic, pneumatic, accoustic and optical); (2) early electric telegraphy by means of static electricity; (3) the development of batteries and other sources of current; (4) telegraphy with electric currents, including the electrochemical telegraph, telegraphy by the aid of electric light, telegraphy based on physiological effects, magnetic needle instruments, instruments operated by the movements of current-carrying conductors, electro-magnetic telegraphy using dial instruments, sounders, printing receivers, &c.; (5) telephones and microphones; (6) lightning arresters and other protective devices, and (7) technical details of station design. In spite of the large amount of detailed information contained in the book, numerous references to the literature of the subject are also given, so that the student is enabled to look up the original sources when desired.

"Telephonology." By H. R. Van Deventer. New York: McGraw-Hill Book Co. London: Hill Publishing Co., Ltd. 1910. Price 17s. net.

"*Transactions* of the North-East Coast Institution of Engineers and Shipbuilders." Vol. XXVI, Part 1. 1909-10. London and Newcastle-on-Tyne: Andrew Reid & Co., Ltd.

"Squilibri di Potenziale Verso Terra in Una Rete di Distribuzione Elettrica." By Ing. Prof. G. Vallauri. Extract from the "Atti della Associazione Elettrotecnica Italiana."

The Japan-British Exhibition.—Mr. W. M. Mordey, as chairman of the Electrical Engineering Committee of this Exhibition, has issued the following letter to the electrical manufacturers of the United Kingdom:—

"On behalf of the Electrical Engineering Committee for the forthcoming Japan-British Exhibition at the White City, I shall be glad if you will allow me to call the special attention of electrical engineers to the advisability of making a thoroughly representative exhibit of the products of our industry.

"The Exhibition—which will be open during the whole of the summer—will, no doubt, be visited by a large number of influential people from Japan, and will attract the attention of the very numerous tourists from all parts of the world who visit London during the summer.

"Our enterprising ally, Japan, is very much alive to the advantages to be derived from the use of electrical engineering appliances of all sorts, and presents a large and growing field for such work.

"It is very important that our visitors should realise that this country occupies a leading position in all matters connected with electrical engineering, and there can be no better way of bringing this result about than by a good representative exhibit in all important sections of electrical engineering, particularly those dealing with power and lighting."

Trade Announcements.—The Sandycroft Foundry Co., Ltd., have removed from 6 to 9, Queen Street Place, E.C.

The British Thomson-Houston Co., Ltd., Rugby, have opened a branch office at Royal Chambers, Cardiff, to care for their business interests in the South Wales district.

Messrs. Nalder Bros. & Thompson, Ltd., have appointed Mr. Arthur P. Haslam, M.I.E.E., of Suffolk House, Laurence Pountney Hill, E.C., their representative for the sale of limiters, telethermometers, &c., in the London district.

Mr. L. A. Wells is commencing business at 19, St. Margaret's Street, Canterbury, as an electrical engineer, and he invites firms to send him catalogues, &c.

Servia.—A report by the Belgian Legation in Belgrade states that there is an increasing demand in Servia for steam engines, locomotives, electrical apparatus, rolling stock, &c.

"Tantalum" Lamps in an Explosion.—The illustration below shows a two-light fitting with tantalum metal-filament lamps which was found amongst the *débris* after a terrific explosion. A large still on the premises of Mr. J. E. C. Lord, at Salford, which contained carbolic acid, exploded on January 24th, and the burning liquid spread the flames in all directions. The fitting and lamps in question were fixed on the outside brickwork of the still, and were connected by means of overhead wires on insulators. The whole of the front of the still was blown out and some of the brickwork was hurled a distance of 20 yd. or 30 yd., and, being soaked in the liquid, at the same time caught fire. The wires connecting the fitting, however, did not break and pulled the insulators, fitting, &c., back into the *débris* where it was found after the fire had done its worst. Though the fitting was badly damaged and burnt and had been under water for two hours, the thick outer globe being broken to pieces, both of the tantalum lamps were intact when put on circuit. It is stated that after the still front blew out they must have fallen approximately 15 ft., and as they had been in use since June, 1909, the strength of the filament was again demonstrated. We believe that Messrs. Siemens Bros. Dynamo Works, Ltd., of Dalston, are continually receiving illustrations of the ability of their tantalum lamps to behave efficiently in all sorts of positions in which extreme vibration is experienced.

A Tantalum Lamp Fitting, found among the Debris of an Explosion.

Catalogues and Lists.—Electric and Ordnance Accessories Co., Ltd., Aston, Birmingham.—Folding leaflet relating to the efficiency and prices of their "E.O.A." metal-filament lamps.

Messrs. Siemens Bros. & Co., Ltd., Caxton House, Westminster.—Reprint No. 517 C, "The Lighting of Rossall School," which describes in detail the concentric "Stannos" wiring of the school.

Messrs. Newtons, Ltd., Taunton.—Catalogue and price list of "Zone" dynamos and motors, which are made in sizes up to 350 kw., and are noteworthy for their special system of ventilation and field-magnet winding, sparkless commutation being obtained without commutating poles. Motor-starters, &c., are also listed.

The B.T.-H. Co., Ltd., Rugby.—Leaflet relating to their B.T.-H. ampere-hour, induction and prepayment meters, with prices.

Messrs. W. F. Dennis & Co., 49, Queen Victoria Street, E.C.—Thirty-page price list of goods stocked by the firm in London, these including copper and bronze wire, galvanised sheets, bolts and nuts, wire ropes, flexible wire, cords, &c.

Messrs. Aubert Grenier & Co., 68a, Lincoln's Inn Fields, W.C.—Twenty-four-page illustrated catalogue and price list of their underground cables. A table showing the comparison of wire gauges and weights is followed by a telegraph code. Thereafter come a number of clearly set-out tables (with prices brought out in red) of paper-insulated, lead-covered cables—single cables with aluminium conductors, concentric, triple-concentric, twin, three-core, and three-core with neutral conductor, for 660 volts, concentric high-tension for 2,200 volts, three-phase high-tension for 3,300, 6,600 and 11,000 volts, also vulcanised bitumen cables (single conductor) and concentric and three-core paper-insulated vulcanised bitumen-covered.

Messrs. Falk, Stadelmann & Co., Ltd., 83-87, Farringdon Road, London, E.C.—New list (No. P666) giving particulars, with prices and illustrations of the firm's "Aladdin" lanterns for "Efesca" and other metal-filament lamps. These lanterns, of which we show one for three lamps of 50-c.p. or one of 100-c.p., are in demand for shop front lighting and for the lighting of open spaces

"Aladdin" Lantern.

and streets where lamps of high candle-power are required. The length of the fitting is 15½ in.; the globe is 13 in. in diameter. The casing is in zinc, green-japanned with gold relief, and the fitting has an opal and flint horizontally-halved globe. Messrs. Falk, Stadelmann will send copies of the list on application.

Messrs. Gibbons Bros., Ltd., 168, Palace Chambers, Westminster, S.W.—Pamphlet No. 27 containing half-tone views of a number of elevating and conveying plants that have been installed by them.

Dr. Heinr. Traun & Sons, London Agency, 8, Redcross Street, E.C.—Revised price list for ebonite, embodying the advance of 10 per cent. notified in November last; also price list of some new qualities of ebonite sheets, tubes and rods at lower prices.

Messrs. Souper & Callaghan, 48, Grosvenor Chambers, Deansgate, Manchester.—Circular describing the Cummins patent automatic sanding device for tramway emergency braking, which is worked by a solenoid in circuit with the electric emergency brake. Also circular describing the armature and field coils of the Manchester Armature Repair Co., for which the firm are managing agents.

Mr. Robert W. Paul, New Southgate, N.—Leaflet (B 4) giving an illustrated description and prices of woven wire adjustable arc lamp resistances which have been specially designed to meet the requirements of the Cinematograph Act, 1909.

Private Meetings.—Ramsbottom & Bennett, electrical engineers, Manchester.—A meeting of the creditors interested in this matter was held last week, when it was reported that the liabilities amounted to £617. Of that amount £397 was due to trade creditors, the balance of £219 16s. being in respect of a claim by the bank. The net assets are expected to be £62. The estate thus showed a deficiency of £555. It was stated that the bank were secured by Mr. Ramsbottom, the father of one of the debtors. It appeared that the debtors commenced trading in partnership in January, 1909. At the outset there were three partners, but within a month one of them retired, and since that time the two debtors had carried on the business. All the liabilities which existed at the time of the dissolution had been discharged. Books of account had been kept, but they were not sufficient to admit of the usual trading figures being prepared. Certain contracts had been carried out by the debtors, some of which had resulted in a loss being made. Dissatisfaction was expressed at the position disclosed, and it was decided to leave the matter to be dealt with by the Court.

W. H. Alvey (trading as Alvey & Bower), Packer's Row, Chesterfield, electrical engineer, &c.—A meeting of the creditors of the above, was held on 18th inst., when a statement of affairs was presented, showing liabilities to unsecured creditors of £1,260. There were also partly secured creditors for £149. The estate showed an apparent surplus of £61. The debtor's late partner started an electrician's business. The debtor knew little or nothing of this branch of the business, and had been obliged to employ a manager. It was suggested that the present position had been brought about by losses on that portion of the business. In May, 1908, a balance-sheet was prepared, and this showed profits of about £190, against which there were drawings of £320. It was stated that the debtor was not at present able to make any offer, but it was thought that if a purchaser could be found for the electrical department the debtor's friends would assist him in carrying on the ironmongery business. The creditors decided to confirm a deed of assignment already executed to Mr. S. E. Short, accountant, of Chesterfield, and the following were appointed as a Committee of Inspection:—Messrs. S. Gratrix, Junior & Brothers, Ltd., Manchester; Veritys, Ltd., Manchester; and the Metallic Seamless Tube Co., Ltd., Birmingham. It was understood that the business would be continued for a short time, and if the efforts made to find a purchaser were unsuccessful, then the assets would be realised.

New Portuguese Tariff.—The Lisbon correspondent of the *Standard* states that the definite approval by the German Parliament of the Portuguese commercial treaty has secured Germany against the risk of having her exports come under the Surtax Law, by which imports into Portugal may be made to pay as high as double the present rates. Already Portuguese merchants who have previously bought from British firms are in treaty with German houses for their supplies. All countries which do not concede Portugal reciprocal commercial advantages will be penalised; Great Britain is one of the countries having no commercial treaty with Portugal, and the approval of the treaty with Germany is generally regarded as a severe blow to British trade, whose supremacy in Portugal is now seriously threatened.

Liquidations.—Phosphor Bronze Co., Ltd., 87, Sumner Street, S.E.—The first meetings of the creditors and shareholders were held on Tuesday last week at the Carey Street offices of the Board of Trade, Mr. W. J. Warley, official receiver, presiding. The accounts filed under the liquidation showed total liabilities £16,593, and assets valued at sufficient to yield a surplus of £12,853, after payment of all debts; but with regard to the contributories a deficiency of £10,711 was disclosed. Mr. Jenks and Mr. Child were respectively nominated for the post of liquidator, and the appointment will in due course be made by the Registrar.

Capilliform Telegraph Instrument Co., Ltd.—A meeting is to be held at 54, Gresham Street, E.C., on March 23rd, to hear an account of the winding-up from the liquidator, Mr. H. Clough.

Adams-Randall Telephone Patents Co., Ltd.—A meeting is to be held at Dashwood House, E.C., on March 22nd, to hear an account of the winding-up from the liquidator, Mr. W. H. Parker.

Bankruptcy Proceedings.—Ernest Goodman (E. Goodman & Co.), electrical engineer, Fairfax Street, Coventry.—First and final dividend 2s. 4½d. in the £ payable February 25th, at 8, High Street, Coventry.

Enamel Insulation.—We understand that since the publication of their pamphlet (see Electrical Review, January 28th) Messrs. Connolly Bros., of Blackley Vale, Manchester, have experienced a great increase in business for their enamel wire. One important effect of the pamphlet has been the settling of a good many points that some people were in doubt about regarding the subject. The matter has now been put on to a proper basis by informing those interested as to just where enamel wire is useful and where it is not. Messrs. Connolly are also receiving important inquiries for enamel for insulating light metallic articles of small weight, and it is going to be adopted in this direction. Owing to the fact that the gloss of the enamel is found to be trying to winders in some places, the firm have now introduced a dull-coloured enamel for use where the gloss is objected to. It will be remembered that Messrs. Connolly had a fire at their works recently; we are glad to report that they have now recovered from the effects thereof, and everything is working at full swing.

LIGHTING and POWER NOTES.

Australia.—As a result of the application of the Melbourne Electric Supply Co. for consent to supply the Brighton Council with electricity, it was decided recently by the Council that a poll of the ratepayers should be taken on the question.

Barking.—The electrical engineer is to prepare a report upon alternative schemes for (*a*) extending the present generating station; or (*b*) removing the works to a riverside site. It is further proposed to invite tenders for (*a*) the sinking of a well to supply water for the electricity works only; and (*b*) the sinking of a well to supply water to the electricity works and the public baths. Tenders are to be invited for the supply of a 200-kw. transformer.

Belfast.—The electrical engineer has submitted a summary for the year ending December 31st, 1909, from which it appears that there was an increase in the quantity of electricity supplied for all purposes of 22·7 per cent. These figures were exclusive of the units supplied for tramway purposes. Mr. Bloxam further reported on the tenders for two water-tube boilers, economisers and stokers, and that of Messrs. Babcock & Wilcox, which he considered the most advantageous to the Corporation, was accepted.

Bishop Stortford.—The U.D.C. has decided by seven votes to four to confirm the E.L. order already obtained, and to proceed with a scheme for carrying it out. It has also been decided to oppose the Bill of the gas company which seeks powers for electric lighting.

Bolton.—A L.G.B. inquiry was held on Wednesday, last week, in connection with the proposed acquisition of a site at Astley Bridge for the erection of a new generating station, and for other purposes. The site, which has an area of over 30,000 sq. yd., adjoins the L. and Y. Railway and possesses valuable water rights, and it is proposed to expend £4,605 in purchasing it.

Caversham.—The U.D.C. has decided to support the Bill to extend the area of supply of the Reading Electric Supply Co., Ltd., which has offered electricity to Caversham at rates similar to those in Reading.

Chichester.—The Education Committee has invited the Electric Supply Co. to submit a tender for installing the E.L. at the new schools in Orchard Street. A request from the company to tender for the street lighting of the city has been referred to the whole Council in Committee. The company undertakes to give an improved light at a lower cost than is paid for gas.

Clitheroe.—The B. of T., in reply to the Council's request for an extension of the E.L. order on account of trade depression in the town, has intimated its willingness to consider the matter at the expiration of the year.

Continental Notes.—France.—Some of the most recent developments in connection with electricity supply in Paris, were referred to in a recent *Times* article, from which it appears that the Compagnie Parisienne de Distribution d'Electricité, which controls the electric supply in Paris, and which is constructing two 75,000-kw. power stations to take the place of the small stations at present in use, has made substantial progress with its scheme. It is proposed to divide the area into three portions, two of them having a three and five-wire d.c. supply and single-phase alternating supply respectively (as at present), and the third area, which has received little attention up to the present, is to have a two-phase system. Sub-stations and transforming points will be provided throughout the area, and 450 km. of main feeders will be laid, partly in subways. Some 80,000,000 fr. is stated to have been spent on the work during the past two years.

Holland.—The Vulkan company intends erecting a large electric station at Kaden to supply current to the greater part of the Westerwald, a portion of the Lahn district and Taunus. Current will likewise be supplied to the motor-building industry.

Austria.—The Austrian Government has decided to nominate a commission to consider the public interests in connection with the granting of water-power concessions. Special attention will be given to the requirements of private industries, although the future needs of the State railways will not be overlooked.

Italy.—The large Italian iron and steel works at Terni have decided to erect an armour plate department, and the orders for the equipment have already been placed with the French firm of Schneider & Co., at Le Creusot. The electric driving machinery will be supplied by Felten & Guilleaume-Lahmeyerwerke, Frankfort-on-Main.

A commencement has been made with the scheme for transmitting 25,000 h.p. from Umbria to Rome electrically, for industrial purposes. A part of this—about 800 h.p.—will be supplied to the Municipality of Rome.

Hungary.—The T.C. of Buda-Pesth has decided to provide the city with a third electric generating station. Prof. Maurus Hoor-Tempus has been commissioned to draft the plans, specifications and estimates of revenue and expenditure of the new establishment, which will be constructed on the Soroksar arm of the Danube, 30 km. from the Gubsacz dam and be driven by water power. According to the calculations the station will be capable of furnishing from 6,000 h.p. up to 20,000 h.p. This station will be able to supply electricity 40 per cent. cheaper than the two existing electric companies. The installation of arc lamps in the Ringstrasse and the substitution of glow lamps for the petroleum lamps now in use, are among the improvements contemplated, as well as the supply of current to two of the municipal waterworks. Private consumers will likewise be supplied at prices ranging between 0·5 and 1·5 heller per kilowatt-hour, instead of four now paid. It is estimated that, on the basis of the present consumption alone, the city will save 1,500,000 kr. a year.

Dundee.—The Ladywell Calender Works Co. are adopting electric drive, part being already installed, and the Ogilvie Street Engineering Works have also installed a complete electric installation for both power and lighting purposes, energy being in both cases obtained from the city supply.

A contract has recently been secured by the Brush Co. for reorganising the power plant of a local group of mills, where four steam engines and one gas engine are in use. One engine is to be retained in conjunction with an exhaust steam turbo-generator plant and motor driving.

Felixstowe.—At the recent annual meeting of the Felixstowe Gas Co., the chairman, referring to the lighting of a new pavilion, said "it was so successfully done that many persons had unconsciously thought it was lighted with electricity." An "unconsciously" given testimonial from a Gas chairman!

Greenock.—During the past six months there has been an increase of 30 per cent. in the electricity supplied from the Corporation power station, as compared with the corresponding period last year, while at the same time there has been a saving of 25 per cent. in fuel. Owing to the erection of the torpedo factory in the district, the plant has been augmented, and the Admiralty has now given notice that it intends to take a supply of electricity from May 1st. It is expected that as the Admiralty has increased its original demand, it will later apply for more power, and arrangements are being made for this.

Hastings.—The municipal electric lighting undertaking was a subject of strong debate during the consideration of the annual estimates at last Friday's meeting of the Corporation. For several years there has been a heavy deficit on the electricity accounts, and every proposal to develop the business meets with strong opposition from the "Economists." Last year the price of current was increased, and this has put an additional annual charge of £5 per lamp on the many arc lamps in the borough. It is anticipated that the increased charge will benefit the undertaking to the extent of over £2,000 a year. In the course of Friday's debate it was elicited that the total loans created for electric supply amounted to £170,766, but that the balance outstanding on March 31st next would be £103,666. The Hastings ratepayers are the biggest customers of the concern, and gradually the gas lamps are being supplanted by electric light standards in all streets where the cable has been laid.

India.—According to *Indian Engineering*, the Madras and Southern Mahratta Railway has arranged for the electric lighting of the trains on their broad gauge sections, which up to now have been lighted by gas.

London.—Poplar.—The charge for electricity for public lighting from April 1st, is to be £13 per kw. per annum, and a further ½d. per unit for all current supplied; this upon the present consumption is approximately equal to a charge of 1½d. per unit. The charge now, which was fixed in 1904, is 1½d. per unit. The Electricity Committee has provisionally adopted certain proposals for extensions to be undertaken during the present year, and has given directions for further information thereto to be supplied them.

City.—At the last meeting of the City Corporation an offer was received from the City of London Electric Lighting Co., to make further experiments in street lighting at an approximate cost of £525 per annum. The Gas Light and Coke Co. offered to make similar experiments at a cost of £360 per annum. The Streets Committee has been authorised to arrange for the experiments in suitable thoroughfares.

Islington.—Thirty-one metallic filament lamps are to be substituted for gas, the existing gas lamp columns to be utilised. The estimated cost is £120. The Electricity Committee reports having been in negotiation with a firm who are at present large consumers of electricity for power and lighting purposes, and who propose to abandon altogether their steam plant, and to install electric motors (which will increase their consumption of electricity for power to over 200,000 units per annum), provided that the Council is willing to make some reduction on the price to be charged. At present the rate is 1d. per unit up to 50,000 units per quarter, and ·8d. per unit for all consumption over 50,000 units. In future the rate of 1d. per unit is to be charged, less 10 per cent. when the consumption amounts to 200,000 units or more per annum providing a three years' agreement is entered into.

Marylebone.—The Baths Committee has accepted an offer of the Electricity Dept. at £400 to rewire the baths, to use lead-covered cable in all damp places, to rearrange the lighting, and to substitute metallic-filament lamps for carbon lamps. In July last the Council laid down a tariff on the "telephone" system of charging for consumers having a maximum demand of 50 kw. upwards. The highest demand mentioned was 200 kw., and in respect of this demand and upwards, it was agreed that £4 10s. per kw. should be charged on a 10 years' contract, payment annually in advance, and 1d. per unit subsequently. The Committee has now decided that this rate should operate as far as 399 kw., and should be lower (£4 per kw.) for such very large consumers as have a maximum demand of 400 kw. and upwards.

Battersea.—The B.C. has agreed to furnish an electric supply to the two working shafts in connection with the new L.C.C. sewer, and mains extensions are to be carried out at a cost of £1,765, towards which the contractors will contribute £600.

Newport (Mon.).—The Electricity and Tramways Committee has recommended the T.C. to increase the price of electricity by ½d. per unit, and to allow 5 per cent. discount to consumers instead of 2½ per cent. recommended by the expert. The addition of plant and the laying of new cables is also recommended, for which it is proposed to apply for a loan of £31,000.

Penistone.—The Yorkshire Electric Power Co. has informed the U.D.C. that the company's further development would be in the direction of Penistone, and whether it included the town would depend entirely on what kind of support it was likely to receive. The company added that it was prepared to supply small urban districts at the same price as large towns, and with the new lamps the usual price was 4d. per unit, which was equivalent to gas at 2s. 2d. per 1,000 ft.

Pwllheli.—The T.C. has decided, subject to the approval of the B. of T., to transfer the E.L. order to Mr. Lavey, on condition that he supplies electricity for lighting at 6d. per unit, and for other purposes at 3d.

Rawtenstall.—The T.C. has fixed the price of electricity for street lighting at 2½d. per unit.

Richmond-on-Thames.—The T.C. has decided to take current from the Electric Light and Power Co. for the motor pumps at Petersham well at 1¾d. per unit, with a minimum annual payment of £100.

Sheffield.—A piece of very smart work was done last week by the Corporation Electricity Department. A gas engine broke down at one of the big works, and at 4 o'clock in the afternoon the department received instructions to replace it by a 10-H.P. motor. The motor was installed and working by 9 o'clock the next morning.

Shrewsbury.—On Friday last, a L.G.B. inquiry was held respecting an application by the T.C. for sanction to a loan of £6,328 for the purpose of developing the Corporation electric light undertaking. The borough electrical engineer (Mr. Johnson) placed the facts before the inspector. He stated that by using up-to-date stokers they would be able to consume cheaper fuel, and it was expected in that way to effect a saving of about £300 a year. He also explained that the Corporation had taken over the street lighting as the mains for the electric supply were extended. The inspector promised to report.

South Africa.—CERES (CAPE COLONY).—The municipality has recently been inviting tenders for an electric light installation, the power to be obtained from a mill stream. The installation is to comprise a pipe line about 300 yd. long, turbine, generator, switchboard, overhead wires for street lighting (70 16-C.P. lamps) and for private consumers. The total capacity of the plant is to be for about 1,400 16-C.P. lamps. Tenders had to be in by February 18th.

In his evidence before the Power Commission at Johannesburg, Mr. Reyersbach stated that the City Deep, Ltd., after having spent £223,000 on plant, will require to spend a further £436,000 on extensions, if electric power is purchased. If the company erects its own power plant, the further expenditure is estimated at £560,000, a difference in favour of purchased power of £124,000. Similarly in the case of the Nourse Mines, Ltd., and Jumpers Deep, Ltd., for both of which increases of plant have been sanctioned, the saving in capital expenditure with purchased power is estimated at £25,100 and £23,800 respectively.

South Shields.—A special meeting of the T.C. was recently held to consider a motion to rescind previous resolutions empowering the Electricity Committee to accept tenders for new plant at the generating station. In support of the motion it was pointed out that the Tramways Department's account would be much less in the year about to end than in the previous year, due to more economical working of the traffic and the improved metering arrangements now in use; also, a large consumer had decided to generate his own electricity. The chairman of the Electricity Committee emphasised the urgency of obtaining new plant owing to the increasing maximum load, which only left a margin of 7 per cent in plant, and, on a division, the motion was lost by 32 votes to 12.

Swansea.—At the B.C. meeting on Wednesday last week, the chairman of the Electric Lighting Committee intimated that a Committee of Inquiry was investigating the circumstances in connection with the recent prosecutions for stealing and receiving electric lamps belonging to the Corporation. At the same time he assured the Council that various rumours flying about were not wholly true, and that although the thefts had been going on for the past 18 months, yet the total loss was only something like 150 lamps. The department had been blamed outside for not marking the lamps, but, as a matter of fact, many are marked, but the marks had been obliterated by some corrosive fluid, so that the efforts of the police to trace the thieves had been baffled for months past.

United States.—New York State, says the *Daily Telegraph*, according to the report of the State Water Supply Commission, has within its area water-power resources superior to those of Colorado and other Western mountain States. After five years' work, the Commission believes that sufficient data have been gathered to warrant the immediate adoption of a State plan of water-power conservation. It estimates that 1,500,000 H.P. now running to waste may be controlled. It proposes, by the construction of a dam at Conklingville, 50 miles north of Albany, to convert 30 miles of the present Hudson River valley into an artificial lake as large as Lake George, to make a storage reservoir. Without counting the Niagara and St. Lawrence Rivers, which belong to the State on the American side, the interior streams of New York are estimated as giving a reserve power equal to nearly a third of all the water-power in use in the United States, sufficient to displace all the power now derived from coal, and to provide the State with all the motive energy it will need for many years.

Watford.—The T.C. has decided to supply electricity to the Water Committee for pumping at 1½d. per unit up to 60,000 units per annum, and 1d. per unit beyond, with a minimum annual payment of £450.

West Ham.—With reference to the supply of energy to the Port of London Authority for use in a portion of the Royal Albert Docks, outside the borough, a deputation waited upon Woolwich B.C. this month, and discussed the matter. The Electricity Committee has agreed to supply current in bulk to the Woolwich Council for distribution by it in the North Woolwich area on the terms set out in the Minute Book, on condition that Woolwich consents to West Ham supplying energy for the requirements within the Dock area under the control of the Port of London Authority, subject to an agreement being executed by the two authorities to contain, among other things, the following stipulations asked for by Woolwich:—(*a*) A supply from duplicate mains; (*b*) the price quoted to be revised, should the West Ham Corporation supply any other consumer under similar circumstances at a lower price.

Willesden.—The Electricity Committee has considered the draft of the proposed agreement with the North Metropolitan Electric Power Supply Co., embodying the new terms upon which electricity in bulk is to be supplied; the clerk reported that the company was prepared to agree to a suggestion made by him that the new agreement should commence from March 31st, 1911, instead of February 8th, and in consideration of the slight extension of the term, the revised rates for bulk supply should date back from December 31st, 1910. This arrangement has been approved. The Committee, with a view to advertising the undertaking, has decided (1) that a shop exhibition be held from time to time in various parts of the district for the purpose of exhibiting electrical appliances; (2) that a manager of such exhibition, who shall also act as canvasser, be appointed at a salary of 2 guineas per week and commission, such appointment to be for 12 months certain.

TRAMWAY and RAILWAY NOTES.

Belfast.—The extraordinary traffic on Saturday week to Cliftonville, on the occasion of the England *v.* Ireland football match, necessitated some 350 carloads of passengers being conveyed to the ground in the space of an hour and a half; the successful arrangements for this and for taking the people from the scene of play were referred to at the weekly meeting of the Tramways Committee.

Canada.—According to *Electric Traction Weekly*, the Toronto City Council has passed a resolution to obtain powers to acquire the Toronto Railway Co.'s system, including the right of operating the lines until the expiration of the present franchise, in 1921. The assets of the company are stated to amount to about 15 million dollars, subject to a four million dollar mortgage.

A new company is being organised in Toronto to obtain a charter for an electric railway to Owen Sound, with branches, covering some 150 miles.

Edinburgh.—The Corporation Tramways Committee recommends the T.C. to adopt the proposal for the construction of an electric tramway from the foot of Ardmillan Terrace, along Slateford Road, to the new markets at Gorgie. There are strong desires that the work should be proceeded with at once, so that the line may be completed in May, when the markets are to be opened.

Hope Bradwell & Castleton (Derbyshire).—The Light Railway Co. has applied to the B. of T. for an extension of one year for the construction of the tramway under the order of 1905.

Leicester.—The annual report of the tramways department shows a total revenue for the year 1909 of £120,543. The passengers carried numbered 27,510,386, an increase of 99,100, and the cars ran 3,433,860 miles, or an increase of 99,724 on the previous year. The total receipts averaged 8·4d. per mile. The working expenses amounted to £73,325; gross profits amounted to £47,218, against £46,140 last year, and interest, sinking fund and income-tax totalled £35,328, against £35,230. The sum of £1,591 was expended on the battery, &c., leaving the net balance £10,699, against £11,351. The output of the generating station for the year was 6,616,650 units, being an increase of 491,620, of which 434,262 units were taken for power supply.

Llandudno.—The suggested proposal for the purchase of the Great Orme Electrical Tramways is now taking a practical form. It has transpired that at a meeting of the Council in committee on February 4th, resolutions were passed recommending the Council to make an offer to the company to purchase the undertaking at an inclusive sum of £7,500; also that, subject to the above offer being favourably received by the company, the clerk be instructed to take all necessary steps with a view to the completion of the proposed transfer. The Council has now decided to hold a statutory meeting to consider the proposal, but it is understood, states our correspondent, that no definite offer will be made to the company before a poll of the ratepayers has been taken on the question.

Rawtenstall.—At the meeting of the T.C. on Thursday, it was reported that there had been a further conference between the Corporations of Accrington, Haslingden and Rawtenstall, and proposals for a three months' through running trial from Accrington to Bacup were agreed upon. Each car is to carry a meter; meters to be read and the aggregate taken at agreed periods. Running is to be commenced as soon as the respective tramway managers can arrange for it.

South Africa.—During a recent meeting of the South African Electric Power Commission, Mr. A. Beaton, Acting Chief Engineer of the Central South African Railways, approved of the general principle of electrifying the lines in the low country, and also the Springs-Randfontein line, largely on account of the economy of labour.

Southport.—The elective auditor reporting to the Corporation upon the tramways, says there is on the Corporation lines a surplus on the year's working of £326, and on the leased lines a surplus of £137. This seemed somewhat small when compared with the profit of £3,658, made by Blackpool Corporation tramways, but the latter, with a length of line exceeding Southport by nearly a couple of miles, carried last year 8,138,569 passengers, as compared with Southport's 4,371,296.

Sunderland District.—At a meeting of the Houghton-le-Spring R.D.C., on the 17th inst., a reply was read from the B. of T., to whom had been sent a copy of a memorial the Council had addressed to the Sunderland Council, urging it to grant running powers to the Sunderland District Electric Tramways Co. over the Corporation's lines from Grangetown to the borough. The Sunderland Corporation refused, and the B. of T. now replied that it had no power in the matter.

U.S.A.—A tramway strike, the second within 12 months, started on Saturday last, in Philadelphia, 7,000 men being involved. The strike is due to the dismissal of some hundreds of employés, and it resulted in a complete suspension of the tramway services. Some of the streets were barricaded by the strikers, who also damaged some hundreds of cars, and in attacking others, caused considerable personal injury.

The construction of lengthy interurban lines appears to be finding much favour in the States. A recent issue of *Electric Traction Weekly*, announced that the Kansas Union Traction Co. was expected to commence work this spring on a 90-mile route; the South-West Texas Interurban Co. has completed surveys for a 250-mile line; and that the Oklahoma City and Ft. Smith Co. has been chartered to build a 200-mile line, while proposals for shorter distance lines are fairly common.

The St. Louis-Kansas City Railway is preparing to start work on its standard gauge electric line from St. Louis to Kansas City, a distance of 550 miles.

The Chicago City Council has engaged Mr. Bion J. Arnold, the well-known American consulting engineer, to prepare plans for an extensive system of subways in the city.

Whitworth.—The Rochdale T.C. will proceed at once with the extension of the tramways to Shawforth, which it will work under an agreement with the Whitworth U.D.C. The complete scheme embraces a line to the centre of Bacup, a distance of 5½ miles.

TELEGRAPH and TELEPHONE NOTES.

Glasgow.—A slight extension of the agreement between the Telephone Department of the Post Office and the National Telephone Co. in Glasgow for the prevention of overlapping in organisation of plant has been arranged, as a result of which there will be no active competition between the Post Office and the National Telephone Co. in Glasgow, so far as canvassing for new subscribers is concerned. The National Co. will do all the canvassing that may be required up to the end of 1911, when the Post Office will take over all the Glasgow and district lines.

Long-Distance Telephony.—According to the Swedish Press, the telephone apparatus invented by the Swedish engineers, Egner and Holmstrom, and used for telephoning great distances, is working well; it is in use in the Stockholm's Handels Bank and the Banking House of Warburg, in Hamburg, and has given the greatest satisfaction. The Swedish telegraphic department has acquired the right of manufacturing the new apparatus, which will probably be made by Messrs. L. M. Ericsson, in Stockholm. It is proposed to use the long-distance telephones between Sweden and Germany, and later on to extend their use to other countries.

Norway.—A Reuter telegram says that the Storthing has voted 1,104,500 kroner (£61,361) for the purchase of the Great Northern Telegraph Co.'s cable between Egersund and Peterhead, and Arendal and Hirtshals, and for the construction of a new cable between Arendal and Newcastle.

Overhead Wires.—Last Friday a dispute between the Postmaster-General and the Tottenham District Council, with reference to a proposal to erect an overhead wire, was decided at Edmonton County Court. It was stated that the cost of an overhead wire would be only £24, while to lay it below the surface would cost over £110. The judge, having visited the place, gave his decision in favour of the Council, with costs.

Press Cable Rates.—Reuter reports that the Governments of the Commonwealth of Australia and of New Zealand, and the Pacific Cable Board, have extended to Press messages by the Pacific cable between Australasia and Canada the benefit of the reduction in rates that was conceded in August last to Press messages between the United Kingdom and Australasia. At the same time the Canadian Pacific Railway has lowered its rate for the transmission of such messages between Vancouver and the Pacific Cable Board station at Banfield Creek, and, as a result of these changes, the rate on Press messages between Australasia and Vancouver has been reduced to 3½d. per word.

Telephone Recorder.—Three Danish engineers, Messrs. Dessau, Nyrop and Thompsen, have recently demonstrated before the Copenhagen telephone authorities the utility of an invention consisting of a small telegraphic apparatus, which is placed in connection with the telephone wires, and which renders it possible for a subscriber, if he does not find the person he wants at home, to transmit his message written in ordinary letters. The transmitting apparatus is constructed in the form of a small typewriter. Our readers are aware that a system of this kind is in use in London. It is said that another Danish engineer has invented small wireless telephones for military purposes. A large order for these small telephones, amounting to many thousands of pounds, was recently given by the German military authorities as they are going to be used on a large scale in the German army.

The Storm.—The gale which was experienced early this week had disastrous effects on overhead wires. The underground cable from Glasgow to London, was, of course, intact, and for hours was the only means of communication with the Metropolis open to many of the English centres, all messages being sent *via* Glasgow. The telegraphic staff in Glasgow were kept at work over Monday night dealing with the arrears. More than 1,000 telephone lines were down in London alone.

Wireless Telegraphy.—An Austrian station for wireless telegraphy has been opened at Pola. Its range is 500 km., and it will be able to maintain communication with vessels up to the latitude of Bari.—*Times.*

The Marconi International Marine Communication Co. have since the beginning of the year received orders for over 30 vessels of the mercantile marine to be equipped with their system.

CONTRACTS OPEN and CLOSED.

OPEN.

Aberaman.—March 14th. Electrical goods for a year to the Powell Duffryn Steam Coal Co., Ltd. Stores Manager, Aberaman Offices, near Aberdare.

Australia.—Melbourne.—Seven sections of branching multiple-magneto switchboard for the P.M.G. See "Official Notices" January 7th.

Telephone switchboards for New South Wales, and poles (iron or steel) for Western Australia, for the P.M.G. See "Official Notices" February 4th.

Wire testing machine, for the P.M.G.'s department in Western Australia. See "Official Notices" February 4th.

One electrically-driven dust extractor for the P.M.G.'s Department in Queensland. See "Official Notices" February 11th.

Barrow-in-Furness.—March 7th. Electrical stores, for a year, for the T.C. Borough Electrical Engineer.

Belfast.—A year's stores for the Tramways and Electricity Committee. See "Official Notices" January 28th.

March 9th.—Arc lamps, masts and base columns, for the Harbour Commissioners. See "Official Notices" to-day.

Belgium.—March 2nd. The Belgian State Railway authorities at the Bourse, Brussels, are inviting tenders for an installation of electric lighting at the railway station at Ath.

Birmingham.—March 8th. Electrical accessories for a year, for the Birmingham, Tame and Rea District Drainage Board. J. D. Watson, engineer to the Board, Tyborn, near Birmingham.

Bolton.—March 5th. Materials and stores for the Tramways Committee. See "Official Notices" February 18th.

Bootle.—March 1st. Complete E.L. installation at the Girls' Secondary School for the T.C. Borough Electrical Engineer, Pine Grove Station.

Brighton.—March 7th. The Lighting Committee is inviting tenders for the purchase of two second-hand Willans engines and two second-hand Crompton generators. See "Official Notices" to-day.

Bristol.—March 8th. Stores for the Corporation. See "Official Notices" February 18th.

Buenos Ayres.—The *Review of the River Plate* states that the Government will shortly call for tenders for the supply of 20 electric cranes, lifting capacity 1 ton, for the warehouses on the East side of Docks 1 and 2, Port of Buenos Ayres.

Carlisle.—March 1st. Two 500-KW. reciprocating steam engine-driven dynamo sets, with ejector condensers for the Corporation. See "Official Notices" February 11th.

March 14th.—Two water-tube boilers, superheaters, mechanical stokers, &c., and two boiler feed pumps, for the Corporation. See "Official Notices" to-day.

Dover.—March 8th. Electrical sundries and cables, for a year, for the Harbour Board. M. Mowll, Registrar, Castle Street, Dover. (Deposit 2s. 6d.)

Dundee.—Mr. H. Richardson, the Corporation electrical engineer, is to obtain offers for the installation of electric driving at the King's Cross Hospital laundry.

Dublin.—March 2nd. Extra-high-pressure and low pressure cables for the Corporation. See "Official Notices" February 18th.

Edmonton.—March 9th. Electrical requirements for the B.G. F. Shelton, clerk, White Hart Lane, Tottenham.

Germany.—The Prussian State Railway authorities in Berlin are about to invite tenders for the establishment of an electric lighting installation at the railway station at Allenstein.

Gillingham.—February 28th. Cables, lamps, meters, &c., for the Council; iron oil tank. See two "Official Notices" February 11th.

Heston and Isleworth.—March 1st. Stores for a year for the U.D.C. See "Official Notices" February 18th.

Hungary.—March 30th. Tenders are being invited by the municipal authorities of Szigetvar for the establishment of a central electric lighting station in the town.

Kingston-upon-Hull.—March 10th. Telephone instruments for the Council. See "Official Notices" February 18th.

Leeds.—February 28th. Annual contracts for coal, cables, meters and other stores for the Corporation. See "Official Notices" January 28th.

London.—ST. PANCRAS.—February 28th. Arc lamp carbons for the B.C. See "Official Notices" January 28th.

BATTERSEA.—Stores for a year for the B.C. See "Official Notices" February 18th.

It is proposed to substitute a new multijet ejector condenser for the one at present attached to No. 6 turbo-generator set at the electric lighting station, at a cost of £150, so as to reduce the steam consumption.

FULHAM.—March 2nd. Stores for the B.C. See "Official Notices" February 18th.

HACKNEY.—The Electricity Committee will shortly be inviting tenders for 80 000 pairs of arc lamp carbons and 7,500 tons of coal.

HAMMERSMITH.—Tenders are to be invited for the supply of eight transformers for delivery in April. One of 250 KW., one of 200 KW. and six of 100 KW. each.

Manchester.—February 28th. Complete electric wiring and fittings for electric lighting of the Exhibition Buildings, Old Hall Lane, Rusholme. Specifications (one guinea deposit) from, and tenders to, W. Davenport, Ridler Place, Holland Street, London, S.E.

March 8th.—E.L. and telegraph materials, for a year, for the Great Central Railway Co. W. Williams, Stores Superintendent, Gorton, Manchester.

Newport (Isle of Wight).—March 2nd. Electrical sundries, for the Isle of Wight County Asylum, for a year. Jas. H. Green, clerk, Whitecroft, Isle of Wight.

Newport (Mon.).—March 8th. E.L. fittings for the Board of Guardians. I. Thomas, clerk, Queen's Hill.

Pontypridd.—March 7th. Electric lamps, stores, paper, rubber, insulated wires and cables, for a year, for the U.D.C. J. E. Teasdel, electrical engineer, Treforest generating station.

Salford.—February 28th. Annual contracts for stores' &c., for the Electricity Department. Specification from Mr. M'Cowen' (Deposit 10s.)

South Africa.—According to the *British South African Export Gazette* orders for a quantity of electrical plant may be anticipated in the near future from the Pigg's Peak Development Co., Ltd. Orders will shortly be given out for electric generators, cables, &c., by the Wankie (Rhodesia) Coal, Railway and Exploration Co., Ltd.

Spain.—The Spanish Post and Telegraph authorities in Madrid are inviting tenders until the 27th inst. for the supply of 100 tons of steel wire 4 mm. dia. and 4 tons of bronze wire 5 mm. dia. for telegraph and telephone lines.

Teneriffe.—March 21st. The municipal authorities of La Laguna, Teneriffe are inviting tenders for the concession for the public electric lighting of the town until 1954.

Transvaal.—April 2nd. The Government is inviting proposals for the erection of local plant for the manufacture of steel from iron and steel scrap. Particulars to be lodged at the office of the Agent-General for the Transvaal, 72, Victoria Street, S.W., and with the Secretary of Mines, Pretoria, by April 2nd.

Watford.—March 1st. Paper-insulated cables for the U.D.C. Electricity Department. See "Official Notices" February 11th.

Wimbledon.—February 28th. Various materials for the Corporation Electricity Department. See "Official Notices" February 11th.

Wrexham.—March 15th. Stores for the T.C. See "Official Notices" February 18th.

CLOSED.

Australia.—The New South Wales Government Railways, Sydney, have provisionally accepted a tender for a 6,000-KW. turbo-alternator and condensing plant from Messrs. Willans & Robinson, Ltd., Rugby.

In a recent issue, *Australasian Hardware and Machinery* gave a list of electrical contracts that had been placed by the Postmaster-General's Departments. The following were among them:—

"Ever Ready" dry cells (1,000), urgently required for the use of the P.M.G.'s Dept., Victoria.—S. Hoffnung & Co., Ltd., £131 (without inviting public tenders).

Cable (one mile), telephone switchboard, silk and cotton insulated and light lead-covered (in 440-yd. lengths), for the P.M.G.'s Dept., N.S.W.—The Western Electric Co. (Australia), Ltd., Sydney, £399 per mile.

Supplies for the P.M.G.'s Dept., Victoria.—Wheatstone instruments: transmitters, receivers, gummers and repeaters, Elliott Bros., £2,375; perforators, the Gell Syndicate, £2,755; 25,000 insulators, Whicker and Co., £677; staples, Lawrence & Hanson, £624; and 250 box and iron-bark poles at South Melbourne, £185, Josiah Parker, Murchison.

64½ miles of paper-insulated, lead-covered telephone cable, for the P.M.G.'s Dept., N.S.W.—Siemens Bros. Dynamo Works, Ltd., £12,573.

Magneto switchboards (six) for telephone exchanges in New South Wales for the P.M.G.'s Dept.—Western Electric Co., £1,476.

Waterproof cloth (3,600 yards at 12s. 6d. per yard) and waterproof tapeing (100 yards at 6s. per yard), for the P.M.G.'s Dept., N.S.W.—Dunlop Rubber Co. of Australasia, Ltd., Sydney.

Aerial cable (11½ miles), for the P.M.G.'s Dept., Victoria.—Union Cable Co., Ltd., Sydney, £1,819.

Switches (150), common battery, single extension and inter-communication, for the P.M.G.'s Dept., N.S.W.—British Insulated and Helsby Cables, Ltd., Melbourne, £1 5s. each.

According to the *Australian Mining Standard* the tender of the General Electric Co., Ltd., of London, for whom Messrs. Lawrence and Hansen, of Melbourne, are agents, has been accepted by the Postal Department for the complete new equipment of the Hawthorn (Melbourne) Telephone Exchange. The price, which is subject to slight variation, is £14,317.

The same journal says that the Postmaster-General, Sir John Quick, last month accepted tenders for the supply of 9,050 new telephones for use in New South Wales, Victoria and Tasmania, at a total cost of £23,676. The tenders accepted were as follows:—Messrs. J. Paton & Co., Sydney, 6,000 wall telephones in New South Wales, £15,600: Messrs. Bartram & Sons, Melbourne, 2,500 wall telephones and 450 table sets, in Victoria, £7,816; and 100 wall telephones in Tasmania, £260. Each of these firms is an agent for the Ericsson company.

Cape Town.—The tender of Messrs. E. A. Shaw & Co., as agents for the British Westinghouse Co, has been accepted for the supply to the Corporation of motor switch panels for the year 1910.

The electric lighting of the Town Hall at Sea Point, near Cape Town, has been entrusted to Messrs. R. M. Ross & Co., of Cape Town.

Devonport Dockyard.—The Admiralty have accepted a tender for two 1,200-KW. direct-current turbo-dynamos and condensing plant from Messrs. Willans & Robinson, Ltd., Rugby.

Government Contracts.—The following tenders have been accepted by the Government Departments named:—

WAR OFFICE.

Incandescent electric lamps.—British Tungsten Lamp Co., Ltd.; Cryselco Ltd.; General Electric Co., Ltd.

Installation of electric light at Stanhope and Marlborough lines, Aldershot.—J. B. Saunders & Co.

GENERAL POST OFFICE.

Paper core cable.—Callender's Cable and Construction Co., Ltd.; Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Western Electric Co.

Glow lamps.—Edison & Swan United Electric Light Co., Ltd.

Copper wire.—T. Bolton & Sons, Ltd.; British Insulated and Helsby Cables, Ltd.; R. Johnson & Nephew, Ltd.; Shropshire Iron Co., Ltd.; F. Smith and Co., Ltd.

Twelve electric lifts at new G.P.O., King Edward Street, E.C.—R. Waygood and Co., Ltd.

Five electric lifts at Head P.O., Bristol.—R. Waygood & Co., Ltd.

Electric lighting of Sheffield new Head P.O.—W. S. Vaughton.

Electric lighting of block B of Postal Telegraph Stores Depôt, Cherrywood Road, Bordesley Green, Birmingham.—Beaven & Sons, Ltd.

Pneumatic ticket distributing system at P.O. Telephone Trunk Exchange, E.C.—Western Electric Co.

Electric storage battery at G.P.O. (West), E.C.—The Electrical Power Storage Co., Ltd.

Electrical switchgear at King Edward Building, G.P.O. (West), and G.P.O. (South), E.C.—British Thomson-Houston Co., Ltd.

Motor converters, &c., at G.P.O. (West), E.C.—Bruce Peebles & Co., Ltd.

Steam, exhaust, feed, &c., pipework at P.O. Central Power Station, Upper Ground Street, S.E.—Alton & Co.

Glasgow.—The T.C. Committee on Tramways, Works and Stores has accepted the tender of Messrs. Musgrave & Sons, Ltd., for new pistons for H.P. cylinders, Pinkston engines.

Herne Bay.—The U.D.C. has accepted the tender of Messrs. Watlington & Co., for 280 flexible bonds for repairing the electric tramway on the Pier, at £7 8s. 6d. per 100, and that of Messrs. Mosers for bolts and railway brobs.

London.—L.C.C.—At the meeting of the Education Committee of the London County Council on Wednesday, it was reported that the following tenders had been received for installing electric light at the Cow Lane school, Rotherhithe:—

Johnson & Phillips, Ltd.	(accepted)	£236 10
G. Weston & Sons, Ltd.		271 0
W. J. Fryer & Co.		304 10
Edmundson's Electricity Corporation, Ltd.		317 0
Stegmann & Co.		330 0
F. A. Glover & Co., Ltd.		340 0
Simmonds Bros., Ltd.		372 0
Brit. Westinghouse Elec. & Manufacturing Co., Ltd...		401 0
Checkogram (1908), Ltd.		590 0

The Highways Committee received the following tenders for bends and roof sticks for electric cars:—

Hurst Nelson & Co., Ltd.	(accepted)	£229
H. Matthews		230
Smith, Parfrey & Co., Ltd.		232
F. and G. Smith		300
Peter Boswell & Sons		318

Engineer's estimate, £285.

The Council is recommended to accept the tender of the Frodingham Iron & Steel Co., Ltd., at £12,790, for 1,500 tons of slot rails and conductor tees for tramway reconstruction works in 1910-11. Messrs. P. and W. Maclellan, Ltd., withdrew their tender (the lowest).

The following tenders were received from selected firms for two static transformers for tramway sub-stations:—

British Electric Transformer Co., Ltd.	(accepted)	£429
Spagnoletti, Ltd.		430
Dick, Kerr & Co., Ltd.		450
British Thomson-Houston & Co., Ltd.		452
Johnson & Phillips, Ltd.		472
Brit. Westinghouse Elec. & Mfg. Co., Ltd. (less 2½ %)	..	476
Electric Construction Co., Ltd.	..	480

Estimate of chief officer, £480.

The list which appeared on p. 262 of our last issue, of tenderers for the test-room instruments for the L.C.C. central car repair depôt, was incomplete. Messrs. Elliott Bros. were, of course, among the firms selected to tender, but their tender was incomplete—that is the reason the name did not appear in our table.

SHOREDITCH.—The Guardians have accepted the tender of James Keith and Blackman Co., Ltd., at £55, for an electric fan with hoods in the laundry.

Messrs. Madame Tussaud & Sons, Ltd. have received tenders for the complete re-wiring for electric lighting and power at their premises, Tussaud's Exhibition, Marylebone Road, N.W., to the specification and scheme of Mr. B. H. Jenkinson, A.M.Inst.E.E., 9, Gray's Inn Square, Holborn, W.C. They are as follows:—

Smeeton & Page	(accepted)	£775
Hill & Harrington		780
Marylebone Borough Council		1,024
Miskin & Rice		1,159

Tenders have been received for the electric lighting of St. Giles's Church, Cripplegate, E.C., also to the specification, plans and designs of Mr. B. H. Jenkinson. The Vicar and Churchwardens have accepted the lowest. Tenders were as follows:—

Hill & Harrington	(accepted)	£82
Smeeton & Page		95
E. P. Allam & Co.		146
Rowland & Hulton		177

Manchester.—The Corporation has accepted the tender of Messrs. Staniar & Clegg, of Manchester, for the lighting of Harpurhey Baths, at £850.

Plymouth.—The Electricity Department has accepted the tender of Willoughby Bros., Ltd. for cast-iron pipework in connection with the new turbines at the Electricity Works, at £40.

The Tramway Committee has accepted a quotation from Messrs. Walter Scott, Ltd., of Leeds, for the supply of 100 tons of tram rails and fish-plates, the rails at £8 per ton and the fish-plates at £10 per ton.

St. Helens.—The T.C. has accepted the tender of Messrs. Walter Scott, Ltd., of Leeds, for rails for relaying the Denton Green tramway track.

Ventnor.—The U.D.C. has accepted the tender of the Isle of Wight E.L. Co. to outline the Pier with 590 coloured incandescent lamps.

Switzerland.—The balance-sheet of the Société d'Electricité Alioth, of Basle, for the last financial year shows a net profit of only £36,787, at contrasted with £44,309 in the preceding 12 months. A dividend at the rate of 6 per cent. is, however, being maintained.

FORTHCOMING EVENTS.

Physical Society.—Friday, February 25th. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. Papers on "Telephone Circuits," by Prof. J. Perry; and "The Laws regarding the Direction of Thermo-Electric Currents Enunciated by M. Thomas," by Prof. C. H. Lees.

Institution of Civil Engineers.—Tuesday, March 1st. At 8 p.m. Paper on "The Hudson River Tunnels of the Hudson and Manhattan Railroad Company," by Mr. C. M. Jacobs, to be further discussed.

Institution of Electrical Engineers (Manchester Students' Section).—Tuesday, March 1st. At 7.30 p.m. At the Municipal School of Technology, Manchester. Paper on "The Commercial Side of the Electrical Industry," by Mr. J. L. Brooks.

Saturday, March 5th. Visit to the Birkenhead works of the English McKenna Process Co., Ltd.

Institution of Electrical Engineers (Birmingham Section).—Wednesday, March 2nd. At 7.30 p.m. At the University, Birmingham. Meeting.

Institution of Electrical Engineers (Students' Section).—Wednesday, March 2nd. At 7.45 p.m. At 92, Victoria Street, S.W. Paper on "Insulating Materials," by Mr. T. J. Sack.

Royal Institution.—Thursday, March 3rd. At 3 p.m. Lecture on "Illumination Natural and Artificial," by Prof. S. P. Thompson. (Lecture III.)

Friday, March 4th. At 9 p.m. Discourse on "Magnetic Storms," by Mr. C. Chree.

Saturday, March 5th. Lecture on "Electric Waves and the Electromagnetic Theory of Light," by Prof. Sir J. J. Thomson. (Lecture IV.)

Rontgen Society.—Thursday, March 3rd. At 8.15 p.m. At 20, Hanover Square, W. Paper on "Dental X-Ray Technique," by Mr. C. A. Clark. Mr. F. H. Glew will show a radium collector for atmospheric electricity.

Northampton Institute Engineering Society.—Friday, March 4th. Paper on "D.C. Liquid Starters," by Mr. J. K. Hwoo.

Saturday, March 5th. Visit to Robertson's Lamp Works.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

THE following orders are announced:—

Commanding Officer—COL. R. E. B. CROMPTON, C.B.

Monday, February 28th.—"A" Company. Recruits' infantry drill, 6 to 7 p.m.; technical drill, 7 to 9.30 p.m.

Tuesday, March 1st.—"B" Company. Technical drill, 7 to 9.30 p.m.

Wednesday, March 2nd.—Gymnasium, 6.30 to 9.30 p.m.

Thursday, March 3rd.—"C" Company. Technical drill, 7 to 9.30 p.m.

Friday, March 4th.—"D" Company. Recruits' infantry drill, 6 to 7 p.m.; technical drill, 7 to 8.30 p.m.; infantry drill, 8.45 to 9.45 p.m.

Saturday, March 5th.—No week-end training this week.

(Signed) P. H. CAMPBELL, Capt. R.E. and Adjutant,
For O.C. E.E., L.D.

NOTES.

"Find the Pole."—We greatly regret that, through a mishap to a letter of his, in this office, the name of Mr. J. Hardie McLean was attached to the article published under this heading in our "Correspondence" columns on February 11th. Mr. McLean in his letter mentioned an enclosure, but, unfortunately, the letter and enclosure became separated, and the result was that this article was published over Mr. McLean's signature.

Meters: Correction.—With reference to the note on page 263 of our last issue regarding the meters of the British Thomson-Houston Co., Ltd., a slight correction is necessary. We stated types *H.H.*, A.C.T. and R.H. meters; this should be instead *M.H.* (Mercury Meter), A.C.T. and R.H.

Annual Dinners.—The staff of the Gloucester Electricity Department met at the Greyhound Hotel recently for their first annual dinner, some 35 sitting down as the guests of Mr. F. H. Corson, the city electrical engineer. A smoking concert followed, among the items in the programme being songs rendered by Messrs. Smith and Thain, charge engineers, and Woodward and French, junior charge engineers; Mr. Calsgreedy, charge engineer, was unavoidably absent.

The third annual dinner of the staff of Electrical Installations, Ltd., was held at the Horse Shoe Hotel, Tottenham Court Road, on Saturday, February 19th, Mr. Horace F. Simon, managing director, presiding. About 50 members of the staff were present. The chairman, in proposing the toast of the company, commented upon the satisfactory development of the company's business. The dinner was followed by a musical programme, which was carried out by the various members of the staff.

South African Trade.—According to the *Daily News*, Mr. R. Sothern Holland, his Majesty's Trade Commissioner for South Africa, has just concluded an extended tour through the principal manufacturing centres of Great Britain for the purpose of interesting manufacturers in the South African market, and of supplying information regarding the trade conditions in that country. Manufacturing centres have evinced the keenest interest in the information regarding South African markets, and a large number of manufacturers hitherto unassociated with the South African market are now taking steps to establish, for the first time, trade relations with that country. This is particularly the case with those connected with the iron and steel industries, and with manufacturers of machinery of a mining and agricultural character. Throughout the tour a strong point has been made of the necessity for personal visits to South Africa on the part of the heads of British manufacturing houses, and several such visits, says Reuter's agency, are in process of being arranged.

German Wire Lamp Prices.—The first effect of the reduction in the prices of metallic-filament lamps by the A.E.G., to which reference was made in our editorial columns recently, has been the holding of a hastily-summoned meeting of other leading makers of this type of lamp to discuss the situation created by this action. Among those present at the gathering were representatives of the Siemens & Halske Co., the Gasglühlicht-Gesellschaft, the Felten & Guilleaume-Lahmeyer Works, the Bergmann Electricity Co., the Julius Pintsch Co., Ehrich & Graetz, and the Wolfram Lamp Co. After full consideration the conference resolved not to lower prices without first ascertaining the views of lamp dealers and the electricity supply works, which, in the opinion of those present, were prejudicially affected by the unexpected action of the A.E.G. The explanation of the injury alleged to be caused to lamp merchants and supply works is to be found in the circumstance that they possess, according to the statements made at the meeting, large stocks which were formed in the erroneous anticipation that the accumulations would be exempt from the lamp tax, which came into operation last October, and it would, therefore, follow that reductions in prices on these stocks would bring about heavy losses on the part of the holders. But the A.E.G. disputes this assertion in the course of a circular which has speedily followed the announcement of the result of the conference of other principal makers. The company points out, in fact, that it is out of the question that dealers and contractors will be prejudiced by the price concessions, as the stocks held by them are small, and the use of wire lamps, and consequently their sale, would experience an increase owing to the measure adopted by the A.E.G. The action of the company is said to have been taken solely with the object of promoting the use of the most suitable types of wire lamps for lighting purposes, as the 16-c.p. lamp should no longer be regarded as the normal lamp in competition with incandescent gas lamps, but rather lamps of higher illuminating power. It is added that such lamps can be more easily and cheaply produced than thin filament high-pressure lamps, or 16-c.p. lamps for 110 volts, and this justifies the variation in the prices. The company concludes by stating that in order to satisfy customers in this direction, the new quotations will also apply to the lamps ordered prior to the reduction in prices.

Since the foregoing was written, we learn that a further conference of tungsten lamp-makers has been held in Berlin in the presence of representatives of the largest firms in Austria and Holland and of the Westinghouse Co. The conference, which took place on February 10th, was preceded by a discussion with lamp dealers and the Syndicate of Installation Firms, who expressed themselves unfavourably to the introduction of lower prices, having regard to the quantity of lamps held in stock. On the other hand, the installation contractors suggested the formation of a wire lamp syndicate similar to the existing Glow Lamp (Carbon-filament) Syndicate, on the ground that it would result in stability in prices, but the opinion of most of the makers was against such a syndicate without the A.E.G., although the latter, after remaining outside the Glow Lamp Syndicate for six months, became, and still is, one of its constituents. The representatives of electric supply works present refrained from taking up a position either in favour of or against reductions in prices. At the conference itself the makers decided that lower prices should not come into operation before March 10th, but in the meantime it is open to each firm to reduce quotations as may be deemed advisable. It is assumed, therefore, although further meetings are to be held to consider the amount of the concessions which are expected, that prices will generally fall by the second week in March to the level of those quoted by the A.E.G. The Siemens & Halske Co., whose manufacture of tungsten lamps is still in an initial stage, has arranged only to lower the rates for tantalum lamps, which are already cheaper than the former, by a proportion corresponding with the reduction in tungsten lamps.

Price Reduction.—As we go to press we have received notice from the Electrical Co., Ltd., Charing Cross Road, that the wholesale prices of their Aegma metal lamps have been reduced as from March 1st, the chief reductions being in connection with lamps of 16 to 50 c.p. The trade is invited to push the sale of the lamps of higher candle-power, the filaments of which are less fragile than those of lamps of low c.p. at 100 and 200 volts.

The Board of Trade Commercial Intelligence Branch.—The Board of Trade desire to point out to British manufacturers and merchants, who wish to obtain information in regard to trade matters in the colonies or foreign countries, that it is desirable that applications should first be made to the Commercial Intelligence Branch, 73, Basinghall Street, London, E.C., before communications are addressed to the Board of Trade Correspondents or to H.M. Consular Officers abroad. By the adoption of this course, much delay will be avoided by the inquirer in cases in which the Commercial Intelligence Branch is already in possession of the required information. Communications addressed to the Board of Trade Correspondents or to H.M. Consular Officers should be sent direct and not through the Commercial Intelligence Branch. Catalogues, price lists, &c., should also be forwarded direct. It is needless to send identical inquiries to the Commercial Intelligence Branch and to H.M. Consular Officers (or the Board of Trade Correspondents in the Colonies) as the latter are the correspondents abroad of the Commercial Intelligence Branch.

Blackburn Corporation Tramways.—An interesting ceremony took place at Blackburn on Thursday evening, February 17th, when the new Employés' Institute of the Corporation Tramways Department was opened. The general manager, Mr. J. H. Cowell, as president of the Institute, detailed the history of its formation, which had been engineered by the employés. Councillor C. Higham, vice-chairman of the Tramways Committee, performed the opening ceremony. A game of billiards took place on the new table; this was followed by a smoking concert.

Train Lighting.—The recent disastrous accident on the Canadian Pacific Railway, the fatalities in which were augmented by the fire occasioned by the gas used for lighting the carriages, is evoking the liveliest expressions of disapproval in Austria, as regards both the use of gas on trains and the official ignoring of the claims of the electric light. In four recent railway accidents on the Continent, the death roll was increased by the fires which ensued, occasioned by the ignition of the gas from the carriage lighting apparatus. Notwithstanding this, the Ministry of Railways is steadily proceeding with the introduction of the incandescent gas system on all the State Railways, which are expected to be completely equipped with this system of illumination by the end of 1914. Two members of the State Railways Council—Herren Rosche and Kareis—have moved resolutions and taken other action in the Council in favour of the substitution of electricity for gas on the State Railways, and it is very unlikely that the Government can long ignore the drift of public opinion in this connection. It is noteworthy that electric light is already installed on the Nord Bahn and the Aussig-Teplitzer, and the Buschtiehrader railways, and on the Royal Mail trains, where its use is being extended, so that the official railway world is not without practical acquaintance with its advantages.

Post Office Engineering Department.—The seventh annual dinner of the London staff was held at the Hotel Cecil on the 15th inst. Owing to pressure on our space we are obliged to defer the report till next week.

Railway Amalgamation Reports.—A correspondent writes stating that the details in connection with the putting into operation of an agreement between the Lancashire and Yorkshire, Midland, and London and North-Western Railway Companies, whereby, in future, these powerful corporations will pool all traffic, both competitive and otherwise, besides making the fullest working arrangements on a mutual basis possible, are now practically completed. Big developments are foreshadowed under this scheme of amalgamation, and it is confidently expected that the electrification of various lines in Lancashire and Yorkshire will be carried out at an early date. The rebuilding and improvement of numerous railway stations will be commenced, and there will be created much new and additional rolling stock.

Radiology.—A very complete installation of X-ray apparatus has been carried out recently at the Birmingham General Hospital, at a cost of £500. It is stated that the whole of the apparatus is of British manufacture.

Appointment Vacant.—General clerk for the Erith U.D.C. electrical engineer. See our advertisement pages in this issue.

Electrical Trades Benevolent Institution. — The second Festival Dinner was held at the Hotel Metropole on Wednesday; Dr. G. Kapp presided, and expressed his warm approval of the aims of the Institution. Our report will appear next week.

Institution and Lecture Notes —At a meeting in connection with the South Staffordshire and Warwickshire Institute of Mining Engineers, held at Dudley recently, Prof. J. Cadman, of the University of Birmingham, gave an address on the electric ignition of coal dust. The danger from direct ignition of coal dust by electrical means, he said, was well known, though perhaps not accepted with sufficient seriousness by many mining engineers using electrical power underground. There was little doubt that the careful spreading of stone dust on all roads containing electric cables would be a simple and efficacious method of preventing ignition of dust by accidental flames from underground cables.

Rugby Engineering Society.—The Society held their second conversazione at the Town Hall, Rugby, on Friday, the 11th inst., and it was attended by upwards of 400 members and friends. The exhibits, of which there were a very large number, included a full-size Blériot monoplane in working condition. A large number of models of aeroplanes made by various members of the Society, a working model of the Brennan mono-rail car, the Optiphone, a Foucault pendulum, and many other interesting items were shown. In addition to the exhibits, there was a series of lectures which were fully attended; a programme of instrumental music was carried out, and light refreshments were provided. The organisers are to be congratulated on the great success which attended their efforts.

Institution of Mechanical Engineers.—The annual report of the Council, presented to the meeting last Friday, shows that the membership has increased during the past year from 5,488 to 5,583. The revenue was £14,867, and the expenditure £11,777, leaving a balance of £2,668 (after deducting entrance fees and life compositions). The capital of the Institution amounts to £54,114, apart from redemption funds. The Council has purchased additional premises adjoining the Institution for extensions. The summer meeting this year will take the form of a joint meeting in Birmingham and London with the American Society of Mechanical Engineers.

Birmingham and District Electric Club.—The annual dinner was held on Saturday last at the Colonnade Hotel.

Last week Mr. C. E. C. Shawfield, Wolverhampton borough electrical and tramways engineer, delivered a lecture to the members of the Wolverhampton and District Engineering Society on "Points in Cable Systems."

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—The Plymouth T.C. has increased the salary of Mr. F. Hayes, chief assistant at the electricity works, from £180 to £200 per annum.

Tramway Officials.—Mr. A. R. Foskett, assistant engineer and car-shed superintendent at Chesterfield, who has been appointed assistant manager of the Sunderland District Tramways Co., has been presented by the staff at Chesterfield with a set of drawing instruments and a cigarette case.

The clerk to the L.C.C. has submitted a report by the chief officer of tramways on revision of salaries in his department, and as a result, increases of salaries of 58 officers out of a total administrative staff of 268 officials are recommended. In most cases the advances are recommended on account of added duties and responsibilities, consequent upon extended electrification of the tramways. The following are among the changes proposed:—Mr. W. E. Ireland, rolling stock superintendent, from £450 to £500; Mr. H. Vorley, accountant, from £450 to £475, and then to £500; Mr. E. W. Dickinson, superintendent of Greenwich generating station, from £400 to £450; Mr. T. L. Horn, resident electrical superintendent, from £350 to £375; Mr. J. R. Walker, charge engineer at Greenwich, from £280 to £300; and Messrs. J. P. Dudin, O. A. Pilcher and E. W. L. Nicol, charge engineers at Greenwich, from £250 to £270; Mr. R. G. Thomas, a technical assistant engaged temporarily from 1904 in charge of the drawing office and having under him 28 assistants, is to be placed on the permanent staff at £380, rising to £300.

General.—Mr. E. A. Ingold informs us that he has terminated his engagement as representative to Messrs. J. & H. Grevener.

An Australian exchange says that Mr. Stephen E. Bastow, M.I.M.E., A.M.I.E.E., representing Messrs. Bruce Peebles & Co., Ltd., electrical engineers and contractors, Edinburgh, having completed an extensive business tour in Canada, is now visiting the capital cities of the various Australian States and New Zealand for the purpose of arranging agencies for his firm. Mr. Bastow will return to Scotland, *via* the Cape, and he will spend some time in South Africa. His tour is referred to in the report of the company's meeting, published in this issue of the Review.

Mr. A. A. Voysey, the electrical engineer and inspector of the City of London Corporation, is seriously ill, and has been granted 12 months' leave of absence. If at the end of that period he is unable to resume his duties, he is to be granted a retiring allowance of £100 per annum during the pleasure of the Corporation.

The board of Messrs. Evershed & Vignoles, Ltd., have appointed Mr. Schneider, M.A., who has been associated with the management of the company since its commencement, to be a managing director of the company.

Our contemporary, *Indian Engineering*, understands that Babu Sirish Chunder Basu, the Electrical Supervisor in the office of the Electrical Adviser to the Government of India, has been sent to England on six months' deputation in order to enable him to qualify for the proposed appointment of Laboratory Assistant in the Electrical Standards Testing Laboratory which will be necessary when the new Electricity Act comes into effect. "There is already a laboratory in connection with the electrical advisers' office, but when the new Act and the rules under the latter are passed, the existing laboratory will have to be equipped with the apparatus required for electrical standard testing work. Instead of getting out a specially-trained man from England for the charge of this part of the work of the laboratory, it has been decided to give the Indian assistant in charge of the existing laboratory a chance, and in order to enable him to properly qualify for the work which will be required of him, he has been sent to England to undergo a short course of training in the National Physical Laboratory. We sincerely trust that this Indian will justify the expense of his deputation to England and his selection for his new office."

Obituary.—We regret to learn of the death of Mr. Ernest White, managing director of the New Brotherton Tube Co., Ltd. He was found shot on Saturday last in the Wolverhampton offices of the company. Mr. White had taken a considerable interest in political and other public affairs at Wolverhampton, and was addressing a meeting on the night prior to his death. He had also organised numerous entertainments in aid of charitable objects. Mr. White was appreciated, by those who had business relations with him, as an honourable gentleman and a conscientious business man, and he had the respect and friendship of a number of members of the electrical profession. We understand that the deceased gentleman had suffered greatly from insomnia.

The death occurred at his residence, Old Bailey, Durham, on the 18th inst., of Mr. Charles Emmott, chairman of Messrs. Robert Stephenson & Co., shipbuilders and engineers, of Hebburn and Darlington. The deceased gentleman had had an attack of influenza about a fortnight ago, and was not of strong physique. Mr. Emmott had been all his life connected with commercial pursuits, and was connected with numerous concerns in the North-Eastern district. He was chairman of the Cleveland and Durham County Electric Power Co., and the Cleveland and Durham Electric Power Co., Ltd., a director of the Northern Counties Electricity Supply Co., Ltd., &c. Mr. Emmott married a daughter of the late Duke of Argyll, a sister of the present Duchess of Northumberland, and was a brother of Mr. A. Emmott, M.P., the deputy chairman of the House of Commons.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Polytechnic Estate, Ltd. (70,901).—Trust deed dated January 24th, 1910, to further secure debentures for £4,033 8s. 6d. and £45 15s. costs, charged on property covered by the debentures (registered in January, 1909), and the company's undertaking for supply of electricity for power and light and in connection with electrical machinery. Trustees: Jessie R. Campkin and E. C. Morgan.

Engineering Instruments, Ltd. (66,427).—This company's annual return was filed on January 20th, when 4,250 preferred and 72,500 ordinary shares had been taken up out of a nominal capital of £31,562 10s. in 10,000 5 per cent. cumulative preferred shares of £1 each and 172,500 ordinary shares of 2s. 6d. each. 15s per share has been called up on the preferred and 2s. 6d. per share on the ordinary shares, resulting in the receipt of £12,250. Mortgages and charges: £3,100.

Brentford Electric Supply Co., Ltd. (81,399).—This company's annual return was filed on January 4th, when 7 shares had been taken up out of a nominal capital of £1,000 in £1 shares. No calls have been made. Mortgages and charges: Nil.

Gosport and Alverstoke Electric Lighting Co., Ltd. (82,693).—This company's annual return was filed on December 31st, when the entire capital of £5,000 in £10 shares had been taken up and paid for in full. Mortgages and charges: Nil.

Templer & Ranoe, Ltd. (60,703).—A memorandum of satisfaction in full on January 4th, 1910, of mortgage dated January 24th, 1907, securing £4,378 11s. 6d., has been filed.

Western Telegraph Co., Ltd. (6,886).—Supplemental trust deed dated January 27th, 1910, to secure £239,650 4 per cent. debenture stock, ranking *pari passu* with £800,000 similar stock secured by deeds dated June 20th, 1900, and January 15th, 1902. Trustees: Rt. Hon. Viscount Midleton and Sir John Wolfe Barry, K.C.B.

Central Electric Supply Co., Ltd. (53,080).—Acknowledgment of further indebtedness in the sums of £50,000 and £100,000 (dated January 18th, 1910), under a trust deed of July 2nd, 1905, and indentures of June 10th, 1903, and March 6th, 1905, particulars of which have already been filed. Also further charge under Land Transfer Acts, to secure the principal sum of £110,000, with interest at 4 per cent. on £100,000, with respect to the said issue of £100,000 further stock. Property charged: Land at Marylebone. Holders: Rt. Hon. Alfred Lyttelton, K.C., and W. Hayes Fisher.

Prestwich & Burt, Ltd. — Particulars of £100 debentures created December 30th, 1909, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being issued on January 10th, 1910. Property charged: The company's undertaking and property, present and future. No trustees.

Richard Pape, Ltd.—A memorandum of satisfaction in full on August 19th, 1909, of debenture dated April 5th, 1909, securing £100, was notified on January 27th, 1910. Issue on January 19th, 1910, of £500 debentures (part of a series of which particulars have already been filed), also registered.

Telephone Company of Egypt, Ltd.—A memorandum of satisfaction to the extent of £1,600 on February 2nd, 1910, of trust deed dated July 27th, 1904, and supplemental deeds securing £200,000 debenture stock, has been filed.

Geary, Adams & Co., Ltd.—Particulars of £200 debentures created January 29th, 1910, has been filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £80. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Kinetic Co., Ltd. (105,415).—Particulars of £3,500 debentures created January 18th, 1910, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £3,110. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Filaments, Ltd. (104,108).—A memorandum of satisfaction to the extent of £200 on December 21st, 1909, of debentures dated November 5th, 1909, securing £500, of which only £200 debentures were issued.

Smoke Consumption (Cowper-Coles Patents), Ltd. (99,207).—Particulars of £3,000 debentures created by resolutions of November 30th, 1909, and February 2nd, 1910, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908; the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital (if any). No trustees.

H. T. Boothroyd, Ltd.—Equitable charge on leasehold premises at Bootle, dated February 2nd, 1910, to secure overdraft on Union Bank of Manchester, Ltd., Liverpool, not exceeding £4,000.

E.M.F., Ltd. (104,699).—Mortgage dated January 20th, 1910, to secure £5,000, charged on the company's undertaking and property, present and future. Holder: W. Bein, 18, Clarendon Street, Warwick Square, W.

C. F. Casella & Co., Ltd. (106,869).—Particulars of £2,000 debentures created January 7th, 1910, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £650. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Oriental Telephone and Electric Co., Ltd. (40,691).—A memorandum of satisfaction to the extent of £1,700, on February 2nd, 1910, of debentures covered by trust-deed of June 28th, 1905, and supplemental deed, securing £300,000, has been filed.

Huelva Gas and Electricity Co., Ltd.—The report states that the net profit for the year to December 31st amounts to £3,441, to which has been added the balance brought forward, £548, making £3,989. The directors recommend a dividend of 4 per cent. There is to be written off for depreciation £2,000, leaving £989 to carry forward.

CITY NOTES.

Westminster Electric Supply Corporation, Ltd.

The ordinary general meeting of the shareholders of this company was held on Wednesday, at the offices, Eccleston Place, Belgravia, Mr. W. Hayes Fisher, M.P., in the chair.

The Chairman, in proposing the adoption of the report (see Electrical Review, page 274), read the speech which Lord Suffield, the chairman of the company, had prepared, but which he was unable to deliver owing to his having had to attend at Buckingham Palace. In the course of his speech Lord Suffield said that they had written off the whole of the capital expenditure connected with their old station in Millbank Street. The site had been acquired by the London County Council in connection with their improvement scheme by authority of an Act of Parliament passed as long ago as the year 1900. It provided that the Council should give them a new site which was to be equivalent to the old one, and should also furnish them with a sum of money sufficient to build a new station and to equip it with plant of the same capacity as they had at the old station. This naturally required an arbitration, and the arbitrator's award gave them less than they asked, though more than the Council offered. They had taken advantage of the occasion to acquire the freehold of the whole of the new site which was situated in Horseferry Road, and had built a larger station and had put into it more plant than they had at Millbank Street. They had had, of course, to pay for the additional accommodation and machinery over and above what they had at Millbank Street, but they now had a thoroughly up-to-date station with the most modern plant. The station would be at work in the spring, and they had every confidence that it would be as economical in working as any station in the country. The revenue account showed some diminution in their receipts, due to the increasing use of the metal lamp. This drop occurred mainly in the last quarter of last year, and they would certainly feel it also this year. They might, however, congratulate themselves that they had been able to meet what loss there had been, by economies in working. They had, therefore, not only been able to maintain their 10 per cent. dividend, but to carry forward a larger sum. Until things got more settled, and they could see a rising revenue again, they thought it advisable to keep a considerable sum in hand. Though, however, there was some falling off in the sale for lighting, there had been an increase in the total units sold, because there was an increasing demand for current for other purposes. Their consumers were gradually finding out the advantages of heating by electricity instead of by gas; the large number of electric lifts already in use was being constantly added to, and such industries as they had in their area were now mainly worked electrically. Cooking by electricity also should be quite common before long. It was not expensive, and only needed to be tried in order to convince consumers of its advantages, but they were more conservative here than in America, where many towns were far ahead of us in that respect although our charges for current were far lower. There was an almost unlimited field for the use of electricity for these purposes, and they had arranged to cater for it by low prices. They were at present selling three times as much current for lighting as for other purposes. There was one matter mentioned in the report which he would like to touch upon. They employed a large number of men, and it would be difficult to find anywhere employés who worked more whole-heartedly in the interests of the company. The directors had often regretted the impossibility of propounding a profit-sharing scheme such as that established some years ago by the South Metropolitan Gas Co., or of forming a superannuation fund as was done by many large firms, but the conditions under which they existed as a company subject to future purchase had prevented it. This year, however, after careful consideration, the directors had started the scheme outlined in the report. Its main object was to encourage thrift, and thus enable the company's employés to make some provision for the future, but it also gave them a direct interest in the success of the business by a form of profit-sharing without involving them in any risk. All regular employés were allowed to deposit any number of shillings up to five each week. Interest was paid half-yearly at half the rate of dividend on ordinary shares with a minimum of 4 per cent. Being credited to the account, the interest became compound, but of course any employé might withdraw his money at any time. A deposit of 1s. a week until 1931 would amount at that date to about £100 if the present rate of dividend on ordinary shares was maintained. At present, 85 per cent. of the company's employés had taken advantage of this deposit fund, the average of the deposits being about 2s. each per week. About half the remainder were boys who did not earn sufficient to commence saving, so that the scheme was clearly appreciated. There was at present a little over £900 in hand on account of this fund, but it might amount to between £20,000 and £30,000 by the end of their term. He might add that the young men and boys in the company received regular instruction in technical institutes and polytechnics. The cost of this was small—about £1 per boy per annum on the average—and as the reports and attendances were good, there was no doubt both the boys themselves and the company would benefit. He mentioned these matters, because he was sure the shareholders would like, not only to feel that they owned a sound business, but to know that its success was largely due to the excellent relations which existed between all concerned in working it.

Mr. Roger Wallace, K.C., seconded the motion.

Mr. Hurst said he could not quite make out from the accounts whether they had made a profit on the arbitration proceedings for the removal of their station from Millbank to Horseferry Road. He wanted to know whether they received more from the property than what it was standing at in the company's books. He would also throw out as a suggestion that the company should charge a rate for their current, which would be as favourable as the lowest rates charged in London. As to the provident fund which the directors proposed to start for the benefit of the employés, he would like to know whether the money received on behalf of that fund would be invested in the company's undertaking, or outside. With reference to the investments which stood in the books at £275,989—which he gathered was the cost price—he would like to know whether they could really be sold for that sum.

Mr. Waugh said that the qualifying phrase in the auditor's report, "subject to fluctuations in the market price of some of the investments," seemed to suggest that the fluctuations had been unfavourable.

The Chairman, in reply, remarked that as they were all aware the removal from their Millbank site was forced upon them. They had a much larger station where they were now. It was a profitable exchange in point of view of land, site, and so on, and looking to the future, but no book profit was shown—if anything, there was a book loss. As to the rates charged, he thought they compared favourably with those charged by other companies—certainly by undertakings which were similarly placed. The directors were considering the question of whether the money received on behalf of the provident fund should be invested in, or outside the business. With reference to their investments, the directors had exercised great care in considering what shares to place their money in, and all their investments were of a high-class character. The phrase used by the auditors was, he believed, the ordinary one used by accountants. He could say that they had suffered less loss in their investments than other companies.

Replying to further questions, the Chairman said that they should consider themselves bound to tell the shareholders if there was a substantial drop in the value of the investments. The percentage was less than 5 per cent.

The report was adopted.

Dublin and Lucan Electric Railway Co.—The half-yearly meeting was held at Dublin on the 17th inst., Mr. W. Mooney presiding. The report which was submitted showed gross receipts £3,767, or £33 in excess of the corresponding half of the previous year. After providing for debenture interest the usual half-yearly dividend on the 5 per cent. preference shares had been paid, £350 placed to the reduction of electrical equipment account, clearing off the balance of the debt due to the contractors (Dick, Kerr & Co., Ltd.), £416 remaining to be carried forward, as against £497. The entire amount, including this £350, paid out of revenue, on account of capital, since the opening of the electric line just ten years ago, was £4,793, the only set-off being the temporary advance due to bankers, and their ordinary trade engagements, both of which appear in the present balance-sheet. This large outlay of revenue on account of capital had necessarily prevented the payment so far of a dividend on the ordinary shares, but it had nevertheless enormously strengthened the financial position of the company, and time made the prospects of the ordinary shareholders much brighter.

Prospectus.—*British Columbia Electric Railway Co., Ltd.*—This company is inviting subscriptions for £530,000 4½ per cent. perpetual consolidated debenture stock at par. The list is announced to close to-morrow (Saturday).

Quite a number of new rubber companies have published prospectuses during the past fortnight.

Mansfield and District Tramways Co., Ltd.—After payment of debenture interest and 6 per cent. preference share interest, a balance of £2,223 remains in hand. A dividend of 2½ per cent. for the year on the ordinary shares is recommended, carrying forward £327.

Northampton Electric Light and Power Co., Ltd.—The report states that the depreciation account has been increased by £3,000 (out of which £500 has been written off accumulators), £500 has been added to reserve, and £300 has been written off motors. The sum of £626 will be required for the half-year's dividend on the 5 per cent. preference shares, and the directors propose that 6½ per cent. per annum should be paid on the ordinary shares for the half-year (making 5½ per cent. for the year); £1,053 remains to be carried forward.

Ascot Gas and Electricity Co., Ltd.—The report states that the profit on gas account is £4,722 and on electricity account £374.

Bournemouth and Poole Electricity Supply Co., Ltd.—The directors recommend a final dividend on the ordinary shares at the rate of 6 per cent. per annum for the half-year ended December 31st last, making 5½ per cent. for the year, less income-tax. The dividend for 1908 was 6 per cent.

Hadfield's Steel Foundry Co., Ltd.—In addition to the interim dividend of 1s. per share paid on August 21st, a further dividend of 2s. each on the ordinary shares is recommended, together with a bonus of 6d. per share, free of income-tax, carrying forward £29,323.

United Alkali Co., Ltd.—The directors have declared a dividend of 4s. each on the ordinary shares, placing £50,000 to reserve, and carrying forward about £60,000.

Bruce Peebles & Co., Ltd.

At Edinburgh on the 18th inst. the shareholders held their first annual meeting since the company was reconstructed. Mr. F. E. Andrews presided. The statement of accounts for the period from December 5th, 1908, to December 31st, 1909, have already appeared in the Electrical Review.

Mr. Andrews said that though at first sight, seeing the loss that had been made, the position might appear somewhat disappointing, that was not really so, as considerable progress had been made. The great injury to their business was not so much, because of the liquidation, as on account of the long period of uncertainty between July 15th and the end of November, during which it was said, especially by interested parties, that the company never could, and never would, be reconstructed. During that period, and owing to that cause, the business dwindled, and finally entirely left their works, so that when their new directors entered on their duties they found practically no work in the shops and no orders whatever coming in. After reference to the firm's good fortune in obtaining the services of Mr. Lee Murray as general manager on January 19th, 1909, Mr. Andrews stated that all their designs had been thoroughly overhauled so as to ensure that their manufactures should be of the latest and very best type. During the year over £2,000 had been spent on maintenance and improvements, and that sum had come out of their revenue. They had experienced difficulty in getting the business built up owing to the fact that certain machinery supplied by the old company of Bruce Peebles and Co. was not giving entire satisfaction, due merely to trivial faults and causes which were easily adjusted. These they put right. Competition among manufacturers of electrical machinery being keener than ever during the past year, it was essential to spend a large amount of time and money in following up prospective business and in getting in touch with new customers. It was impossible to economise in that direction; in fact, when orders were scarce it was imperative to spend large sums of money on their selling organisation. They had thoroughly overhauled their branches and agencies, and thus were gradually, though surely, obtaining a steadily increasing flow of orders from Great Britain. Then, as it was out of the question to obtain a sufficiency of work from the United Kingdom, they had given great attention to furthering their business interests abroad. In some cases where agencies established by the old company seemed likely to be satisfactory, they had renewed the old or made new agreements. In other cases, where the results did not seem likely, even under the new conditions, to be advantageous, they looked about for suitable firms to represent them, and had made, or were in course of making, arrangements which, they felt sure, would result in benefit in the near future. It was most desirable, however, in a business such as theirs to get into personal touch with the people on the spot. In the autumn of last year they sent one of their engineers on a business expedition through Canada, Australia, New Zealand and South Africa. They had already received much useful information from him with regard to new work, and they had every reason to expect that the results of his trip would be satisfactory. That was the only way to get a sure footing in foreign markets, and though somewhat expensive, it paid in the long run, and was certainly a better course to pursue than to sit at home, and grumble, waiting for the day of Tariff Reform, which though doubtless it would help their particular industry considerably, might after all not prove a panacea for all the evils of cut-throat competition, insensate jealousy, and excess of productive capacity from which electrical engineering works were at present suffering. With regard to new manufactures, they had made certain arrangements which they anticipated would be very helpful in the near future in assisting them to obtain the volume of business they required. Their cash position was strong, and they had ample working capital. They had gained an enviable reputation for supplying good and reliable machines, and had carried out, and were carrying out, large contracts to the entire satisfaction of their customers. The only drawback was that so far they had not been able to obtain a sufficiency of orders to keep their works full, and so run them on the most economical basis. However, they would in due time place the company on a sound, successful, and profitable basis.

The Chairman explained that two large claims against them by Russian firms had been dropped, and their goodwill would thus benefit to the extent of £37,000.

The report was unanimously adopted; and the retiring directors, Mr. Andrews, Mr. C. H. McEuen and Mr. A. B. Anderson, were re-elected.

Mr. Andrews was voted an extra sum of £320 15s. for special services.

W. T. Henley's Telegraph Works Co., Ltd.—The report for 1909 to be submitted at the meeting on March 4th shows a net profit of £74,666. After paying directors' and auditors' fees and debenture interest, and making allowance for depreciation of buildings, plant, machinery, &c., £57,737 remains plus £25,346 brought forward, making £83,083; £10,000 of this has been transferred to reserve account, the preference dividend has been paid, 15 per cent. is the dividend on the ordinary shares, and £32,396 is to be carried forward. Last year the ordinary distribution was at the same rate. The dividend warrants will be posted on March 4th. At the close of the meeting Mr. George Sutton, the managing director, will be presented with his portrait (by Sir Luke Fildes, R.A.), and a service of plate.

Berlin Grand Tramways Co.

The report of the directors of the Grosse Berliner Strassenbahn for 1909, states that the decline in traffic that occurred in the second half of 1908, owing to the depression in trade and industry and to the competition of the section then opened for traffic by the underground railway and of the municipal tramways, was still unfavourably perceptible during most of the year. But with the improvement in the general economic conditions in the final months, a gratifying increase took place in the traffic, with the result that the total receipts only experienced a slight diminution as compared with the preceding year. It was possible to reduce the working expenses by restricting the services during the hours of light traffic. A substantial share in the reduction was also obtained by the general introduction of the higher speeds which were formerly only permitted on Sundays and holidays, thus enabling the withdrawal of many cars, of which some were used as feeders on the suburban lines. The number of car-miles run was increased, but the cost of current remained almost the same as in the preceding year in consequence of the improved training of the drivers. The profit losses owing to the before-mentioned competition down to the end of the year were represented by £8,680, and this sum had been claimed from the city of Berlin. Although the claim was justified according to the arbitration awards made, it had not yet been satisfied. The percentage of working expenses to receipts amounted to 54·82 per cent. as contrasted with 56·03 per cent. in 1908. The length of track was increased by 1 mile to 326 miles; the number of cars was raised from 2,495 in 1908 to 2,511 last year, and the number of the company's employés was 10,231, of whom 1,085 were engaged on the allied enterprises—the Berlin-Charlottenburg Tramway, the Western and Southern Berlin Suburban Tramways and the Grand Berlin Motor-Omnibus Co. The accounts contain the following figures:—

	1909.	1908.
Share capital	£5,004,000	£5,004,000
Bond capital	143,500	212,000
Gross profits	911,160	874,800
Depreciation provision	96,880	90,370
Local taxes	132,000	132,500
Removal fund allocation	138,700	133,000
Net profits	494,400	496,100
Profit share of City of Berlin	43,100	40,400
Dividend	412,800	412,800
" per cent.	8¼	8¼
Passengers carried	396,610,000	397,200,000

The report states that during the year 1,215 persons received slight injuries in connection with the working of the tramways, 165 persons were seriously injured, and 22 persons were killed; and the individual fault of the persons concerned was the cause in the case of 906 of the first mentioned, of 22 in the second class and 18 in the third class. A "foreign" cause was responsible for 46 of the slightly injured, 22 of the seriously injured, and four of the killed, the remainder being due to illness, chance or uncertain causes.

The working results of the three suburban tramways which are jointly administered by the company are also summarised for the past year, whilst in the case of the Grand Berlin Motor-Omnibus Co., it is mentioned that owing to the continual unfavourable results the service in the city of Berlin was suspended on December 1st, as the repeated applications for an alteration of the permitted routes so as to be able to work busy thoroughfares were refused by the supervising authorities. It is proposed to use the motor-omnibuses in future for excursions and "overland" traffic, which are expected to yield improved results.

Electrical Banks in Germany.—It was stated in the recent annual report of the A.E.G., as was mentioned in this journal at the time, that there has hitherto been no scope for the activity of the electrical bank which was formed over a year ago by the company in association with the Siemens & Halske Co. for the purpose of financing electrical undertakings of all kinds. A similar observation also applies to the other electrical bank—the Treuhand Bank für die Elektrische Industrie—which was constituted by the Felten & Guilleaume-Lahmeyer Works with a share capital of £1,250,000, of which £312,500 has been paid. The accounts of this bank for 1909, which is the first business year, show net profits, after deducting administrative expenses, of £11,300 arising from interest, and a dividend has been declared at the rate of 3 per cent.

British Electric Transformer Co., Ltd. — The directors report that the result for the year ending December 31st, 1909, is satisfactory. The accounts show that after paying all manufacturing costs and the expenses of administration there remains a net profit of £11,775, which, with £1,120 brought forward, makes a total available balance of £12,895. The board recommend that out of this there be allocated to depreciation reserve £1,000, to reserve account £4,000, to preliminary expenses written off £1,267, to payment of preference dividend of 6 per cent. for the year £1,904, to payment of a dividend of 5 per cent. on the ordinary shares £3,470, carrying forward a balance of £1,254. Mr. J. F. Albright, the retiring director, offers himself for re-election. Last year the available balance was £11,563, and the dividend on the ordinary shares was 3½ per cent.

Metropolitan Electric Supply Co., Ltd.—The directors have declared a dividend for the half-year to December 31st at the rate of 5 per cent. per annum, making 5 per cent. for the year. The total dividend for 1908 was at the same rate.

Baker Street and Waterloo Railway Co.

SIR GEO. GIBB presided at the Westminster Palace Hotel on the 17th inst. over the twenty-third half-yearly general meeting of the above company.

In moving the adoption of the report (ELECTRICAL REVIEW, page 273), the CHAIRMAN said the accounts were very satisfactory. They had carried 13,920,000 passengers, an increase of 582,895, or 4·37 per cent. The average receipts had been 1·45d. per passenger. Their local traffic amounted to 58·6 per cent. of the total, and yielded 1·54d. per passenger. The through traffic amounted to 41·4 per cent., and yielded 1·34d. per passenger. At the 3d. fare they carried 6·14 per cent.; at 2½d., 7·42d. per cent.; at 2d., 23·54 per cent.; at 1½d., 13·86 per cent.; and at 1d., 48·35 per cent. Their carryings at fares of 2d., 2½d. and 3d. all showed a slight decrease. Those at 1½d. showed an increase of 3·14 per cent., and those at 1d. an increase of 6·74 per cent. The gross revenue had been £88,578, an increase of £2,223, or 2·6 per cent. Working expenses were less by £2,017, or 4·5 per cent. The electric current had cost them per unit 13·7 per cent. less than in the corresponding period, which was due to changes in the equipment at the power house, which were already giving most satisfactory results. The amount set aside for reserve and contingencies and renewals had been £2,000, making a reserve for the year of £6,000. The financial result was that after providing for the preference dividend there was a balance available to pay a dividend at the rate of 1½ per cent. per annum compared with ⅝ per cent. for the corresponding period of 1908. As they knew, the Underground Co. guaranteed 3 per cent. on the shares held by the public for a limited period, and the obligation ceased in August last, but in view of the amalgamation proposals the Underground Co. had agreed to continued the 3 per cent. dividend, and, therefore, the public shareholders would receive 3 per cent. dividend for the last half-year. They would have to spend some money at Oxford Circus, which station showed the largest increase of passengers. At present it was very crowded, and the lift accommodation especially was inadequate. They had not yet quite decided on the plans to be carried out, but were discussing the matter with the Central London Railway Co. and property owners. It was a matter which could only be carried out by agreement, and they had not yet come to any final decision on it. If no other scheme was found to be feasible they would first have to extend the station area and provide additional lifts on the site adjoining the station. The report also mentioned the proposed extension of the Hampstead Co. from their present terminus under the forecourt of the South-Eastern Railway Station to the Charing Cross Station of the Metropolitan District Railway. That extension would provide a very admirable and most convenient station with a new approach from the end of Northumberland Avenue, and he had no doubt it would increase the through traffic. From that point of view, of course, the Baker Street Railway would benefit less than the Charing Cross and the District, but they would get indirect benefit, as it would enable them to get rid of a very bad approach to their Embankment station, and substitute a very convenient approach. As regarded payment, the Hampstead Co. would do the work, and the other companies would contribute annual sums to be fixed in accordance with the benefits each company might receive. The chairman proceeded to deal with the amalgamation scheme, and repeated to a large extent his observations at the Piccadilly Co.'s meeting. He referred to the fact that the scheme had received the approval of the skilled critics of the Press, and pointed out that the Baker Street and Waterloo line must of necessity be of limited growth, as it passed through a district entirely built upon, and therefore they must encourage through traffic with other railways. The debenture stock of the company was £773,150; the preference stock £660,000, of which £108,040 was held by the public, and £551,960 by the Underground Co.; and the ordinary share capital £1,761,450, of which £298,030 was held by the public. The 4 per cent. preference shares of the company would be exchanged for 4 per cent. preference stock of the Amalgamated Co. at par, and the £298,030 ordinary shares of the company held by the public would be exchanged for 4 per cent. preference stock of the Amalgamated Co. in the ratio of £75 of new stock for £100 of existing shares.

ADMIRAL SIR CYPRIAN A. G. BRIDGE seconded the motion, and the report was adopted.

At subsequent extraordinary meetings the amalgamation proposals were adopted.

Telegraph Construction and Maintenance Co., Ltd.

THE directors' report states that the accounts for the year 1909 show a net profit of £85,769, after charging the interest on the debentures. To this sum must be added £104,111 brought forward from last year, making a total of £189,879. From this amount is deducted the interim dividend of 5 per cent. paid July 27th, 1909, amounting to £22,410, leaving £167,469 to be dealt with. Of this sum the directors propose to distribute a dividend of £1 4s. per share, together with a bonus of 6s. per share, absorbing £56,025, being at the rate of 12½ per cent., and making, with the amount already paid, a total dividend for the year of £2 2s. per share, or 17½ per cent., free of income-tax, leaving £111,444 to be carried forward. The general business of the company during the past year has been very satisfactory. The company's works and steamships have been maintained in their usual state of efficiency. The company's 4 per cent. debentures, which matured on January 1st, 1909, have been further extended for a period of ten years from that date, at the same rate of interest. The amount has been reduced to £140,000.

Charing Cross, West End and City Electricity Supply Co., Ltd.

THE directors report as follows for the year ended December 31st, 1909:—

West End Undertakings.—The gross earnings of these undertakings from sales of current, rents, &c, were £142,431 in 1909, as compared with £139,253 in 1908. The expenses, including depreciation, were £90,252, as against £87,785, so that the net earnings were £52,179 for 1909 and £51,468 for 1908. Including the balance of £5,164 from 1908 and £3,649 for interest accrued in 1909, and paying interest on the debenture stock, there is a balance on net revenue account of £43,163, out of which have been paid the dividend for the year on the preference shares, amounting to £18,000, and an interim dividend for the first half-year at the rate of £5 per cent. per annum on the ordinary shares, amounting to £10,000, leaving a balance to be dealt with of £15,163. The directors recommend that a final dividend be paid on the ordinary shares for the second half-year at the rate of £5 per cent. per annum, making £5 per cent. for the whole year, absorbing £10,000, and that there be carried forward £5,163, as against £5,164 last year. The company has now connected to its West-end mains a total equivalent of 613,399—8-C.P. (or 30-watt) lamps, or an increase of 33,897 as against 40,528 added last year. The total is made up as follows:—430,044 in lighting, 15,786 in heating, and 167,569 (6,702 H.P.—5,000 KW.) in motive power.

City Undertaking.—The gross earnings of this undertaking from sales of current, rents, &c., were £139,187 in 1909, as compared with £131,013 in 1908. The expenses were £82,628, against £76,562, so that the net earnings were £56,558 in 1909, and £54,451 in 1908. Including the balance of £5,110 from 1908, and paying interest on the debenture bonds, debenture stock, loans and advances, there is shown a balance on net revenue account of £31,289, out of which has been paid the dividend on the preference shares amounting to £18,000, leaving to carry forward £13,289, as compared with £5,110. The company has now connected to its city mains the total equivalent of 534,776—8-C.P. (or 30-watt) lamps, which is an increase of 39,993 upon last year's figures. This includes 305,001 in lighting, 34,634 in heating, and 195,141 (7,806 H.P.—5,823 KW.) in motive power. The chief engineer certifies that the plant and machinery at the several stations of the company have been maintained in a high state of efficiency.

	West-End undertakings.	City undertaking.
Units generated	7,191,021	28,191,351
Units bought	12,072,125	2,348,425
Quantity sold—Public lamps	427,051	—
Other sales	13,428,154	—
Total units sold..	13,855,205	25,634,172
Used on works, and transmission and distribution losses	5,337,941	4,905,604
Total accounted for	19,193,146	30,539,776
Public lamps	166	—
Total maximum supply demanded, KW. ..	6,409	11,985

Newcastle and District Electric Lighting Co., Ltd.

THE directors' report for the year 1909 shows that the number of units sold during the year was 10,875,205, as against 9,182,095 sold in 1908, being an increase of 18·43 per cent. for the year. The result of the year's working is a gross profit at Newcastle Works of £21,479, and at Lemington and Newburn Works of £1,758, making, with transfer fees, a total of £23,243; adding the balance from last year, £1,104, and deducting interest on debenture stock, temporary loans, &c., £11,750, and directors' trustees' and auditors' fees, income-tax, leasehold redemption fund, &c., £1,278, there remains an available balance of £11,320. The directors recommend a dividend of 3 per cent. for the year (less income-tax), absorbing £8,382, and carrying forward a balance of £2,938. It was found necessary to lay an extra large main cable and also to erect an additional boiler. The expenditure has already proved remunerative. The new substation erected at Newburn is in full operation and has shown excellent results. The whole of the plant and machinery has been maintained in a complete state of efficiency. The directors retiring by rotation are Mr. H. I. Brackenbury, Mr. Arthur Scholefield and Mr. Frank R. Simpson, who are eligible and offer themselves for re-election.

Electrical Distribution of Yorkshire, Ltd.—The directors' report for the year ending December 31st, 1909, shows a satisfactory advance on the working of the previous year. After payment of interest charges the profit and loss account shows a net profit on the year of £184, against a net profit of £13 for the year 1908. This net profit with £13 brought forward from last year makes a total disposable balance of £197 which would be sufficient for a small dividend, but the directors recommend that this balance should be carried forward. During the year the company has acquired the Electric Lighting Provisional Order promoted by the Sowerby Bridge Urban District Council.

W. T. Glover & Co., Ltd.—The directors have declared a dividend of 5 per cent. on the cumulative preference shares and a dividend of 5 per cent. on the ordinary shares for the year to December 31st. Last year the ordinary dividend was at the same rate.

Adelaide Electric Supply Co., Ltd.—The directors have declared a dividend on the preference shares at the rate of 6 per cent. per annum for the half-year to February 28th.

Notting Hill Electric Lighting Co., Ltd.

The annual report of the directors for the year, 1909, shows that the expenditure on capital account at the date of the last balance-sheet stood at £237,743; it has been increased during the past year by £3,709, and now stands at £241,452. The expenditure on capital account exceeds the receipts by £33,452. The cost of the joint station to date has amounted to £221,198, and joint debenture stock amounting to £222,000 has been issued. This stock is subject to a cumulative sinking fund, which now amounts to £34,766, invested in trustee securities. The number of consumers is now 3,021, and with the exception of 36 they are supplied at 200 volts. The gross revenue for the year was £39,878, showing an increase of £976, and the total net profit was £20,859. From the net profit have to be deducted the following sums:—Depreciation, renewal and reserve fund, £3,000; debenture and other interest, £2,440; Kensington and Notting Hill joint debenture stock—interest, £3,401, sinking fund, £1,409 = £9,250. Leaving a balance available for dividend of £11,609. The directors recommend that this be appropriated in payment of the usual dividend of 6 per cent. (less income-tax) on both the preference and ordinary shares, and that the balance be divided in accordance with the articles of association, one-half being credited to the founders' shares and the other half to the ordinary and preference shares. This will enable a further 1½ per cent. to be paid on both ordinary and preference, with a distribution of £3 10s. per share on the founders' shares. An interim dividend of 3 per cent. was paid to the holders of the ordinary shares on July 1st, and the balance of 4½ per cent. will be paid forthwith, together with the distribution on the founders' shares. The preference shares having received their full 6 per cent., the 1½ per cent. bonus will be added to the interim dividend on these shares, to be paid on July 1st next. The amount paid in rates to the local authorities was nearly £3,500, equal to 2½ per cent. on the share capital. The quinquennial assessment is about to be made, and the directors are taking measures to safeguard the interests of the company. The directors have under consideration arrangements for utilising for the benefit of the company the powers conferred by the Act, passed in 1908, containing facilities for combination. The directors retiring in rotation are Sir William Crookes, F.R.S., and Sir Richard B. Martin, Bart., who, being eligible, offer themselves for re-election.

Great Northern, Piccadilly and Brompton Railway Co.

The twenty-third half-yearly meeting of the above company was held at the Westminster Palace Hotel, S.W., on the 17th inst., under the chairmanship of Sir Geo. S. Gibb.

The Chairman, in moving the adoption of the report (Electrical Review, page 274), said that no change had occurred in the capital account, except the issue of the small balance of £1,956 debenture stock, which completed the issue of the company's debenture stock, which now stood at £1,575,956. They had carried 18,338,842 passengers, an increase of 1,348,341, or 7·94 per cent. The average receipt per passenger had been 1·89d., which was a trivial reduction on the figure for the corresponding period of 1908. Their local traffic had formed 67 per cent. of the total, and the average receipt from that had been 2d. per passenger. The through traffic constituted 32·8 per cent., yielding an average receipt of 1·65d. They would be interested to hear of the distribution of traffic according to the fares paid. Dealing with the local traffic, including workmen, at a fare of 4d., they had carried 3·21 per cent. of their total local traffic; at 3d., 26·5 per cent.; at 2½d., 2·61 per cent; at 2d., 30·23 per cent.; at 1½d., 10·06 per cent.; and at 1d., 26·85 per cent. They made an alteration in some fares in October, 1908, by reducing the fares from Finsbury Park to the group of stations between Piccadilly and Knightsbridge from 4d. to 3d. They did so in the hope of getting a larger revenue. It was difficult to trace the precise result of the alteration, for they must, of course, allow something for the normal increase of traffic, but it was satisfactory to know that combining the 3d. and 4d. fares together, they had an increase in numbers of 4·04 per cent. and an increase in receipts of £1,089, or 2·4 per cent., and the alteration of fares was, therefore, he thought, justified by the results. Their local carryings at fares of 1½d., 2d., 2½d. and 4d. showed a slight decrease, whilst those carried at 1d. showed the substantial increase of 12·76 per cent. In his opinion 1d. was an inadequate minimum for any carriers of urban passenger traffic, yet the increase they had obtained showed their ability to compete and to get traffic even at the shortest distances. The public had come to appreciate more and more the greater comfort they obtained by railway travel as compared with any other form of travel. The gross revenue had been £152,340, an increase of £9,106, or 6·4 per cent. The train-mileage showed an increase of 6·07 per cent., the car-mileage 5·05 per cent., and the working expenses a decrease of £2,327, or 3·2 per cent. The electric current had cost them per unit 12½ per cent. less than in the corresponding period, and this satisfactory result enabled him to refer to the departure from England of Mr. Chapman, their chief engineer, whose work here being practically done, was now returning to America. Recently he had superintended changes in the equipment of the power house, which were already producing most satisfactory results, and they might congratulate Mr. Chapman that he was leaving his great work at Chelsea just as it was reaching the stage of its maximum efficiency. They had reserved for renewals and contingencies £3,000, making a reserve for the year of £9,000. But in addition to that they must remember that the price they paid for current included a very large sum for depreciation of the power house plant and buildings—a depreciation much larger than was at all necessary, but which was arranged no doubt with the object of building up in the first instance a large depreciation fund for the security of debenture-holders. The financial result of the half-year was that they had a balance available for dividend of £44,715, out of which the directors recommended the declaration of a preference dividend of 4 per cent. and an ordinary dividend of 1¼ per cent. per annum, which compared with ¾ per cent. in the corresponding period, and they would carry forward £6,024. The chairman went on to discuss at length the Amalgamation Bill which had to be submitted to the special meeting. Summing up what he had put to them about the cancellisation of the Underground guarantee, he said that, first, it was necessary, in order to effect complete consolidation of the stocks, which was the only practical way of getting benefit from the amalgamation. Secondly, the existing guarantee was really of no practical value, for both the debenture stock and the preference shares would be amply secured. To necessitate calling on the Underground Co. to pay the guarantee would mean a falling below his estimate for 1911 of £89,000, and of £51,000 below the actual receipts for 1909. Then again, the dividends on the Tube ordinary shares constituted the bulk of the revenue of the Underground Co., and in looking at the practical importance of the guarantee, they must regard that fact. The Underground Co. was, however, not content to leave the matter there. They wished to deal perfectly fairly with the holders of the public preference shares. Some of these might not care to continue to hold their stock, and their desire to part with it might possibly have the effect of depressing for a time the value of these Piccadilly shares. The Underground Co. desired to protect the shareholders against that, and they had authorised him as the chairman of the three railway companies to give the holders of Piccadilly preference shares the option of selling their shares at a figure which was practically the present market price of the stock. The board recommended the shareholders to approve of the amalgamation of the companies.

Lord Geo. Hamilton seconded the motion, and the report was adopted without discussion.

Subsequently a special meeting of the company was held when resolutions were passed approving of the amalgamation scheme, and also of the Bills being promoted by the Charing Cross, Euston, Hampstead Co., and the Baker Street and Waterloo Railway Co.

There was no discussion on the resolutions.

Charing Cross, Euston and Hampstead Railway Co.

On the 17th inst., at Westminster Palace Hotel, Sir Geo. Gibb presided over the 27th half-yearly meeting of the above company, and in moving the adoption of the report (Electrical Review, page 275), he said that they had carried 14,524,280 passengers, being an increase of 1,508,917, or 11·6 per cent. The average receipt per passenger was 1·65d., the same as in the corresponding half of last year. The local traffic had amounted to 72·06 per cent. of the total, yielding 1·67d. per passenger, and the through traffic had been 27·94 per cent., yielding 1·60d. per passenger. The distribution of the local traffic, including workmen, according to the amount of fare paid, had been 3d. passengers, 13·82 per cent. of the total; 2½d., ·76 per cent.; 2d., 35·21 per cent.; 1½d., 8·17 per cent.; and 1d., 41·63 per cent. The gross revenue had been £105,139, an increase of £11,022, or 11·8 per cent. The train-mileage showed an increase of 29·86 per cent., the car-mileage an increase of 13·68 per cent., and the working expenses an increase of £1,042, or 1·8 per cent. The financial result was that they had an available balance of £18,813, and recommended a dividend at the rate of ¾ per cent. per annum. They were promoting a Bill authorising the company to extend the railway from the present terminus adjoining the Strand to a point under the District Railway. The length of new railway would be rather over 477 yards, and the estimated cost was £203,000. The directors had been engaged in settling up all the outstanding questions with the Underground Co. under the construction contracts, and the result of all the accounts was that there was a balance due to the Underground Co. of £242,094. All these matters had been embodied in an agreement between the two companies. It was proposed in the Amalgamation Bill now before Parliament to authorise the creation of £400,000 new ordinary shares, which sum the Underground Co. had agreed to accept in liquidation of the balance due to them, and the agreement also provided that all superfluous land not required for railway purposes should become the property of the Underground Co.

Mr Hymann seconded the motion, and the report was carried.

An extraordinary meeting was next held, and resolutions were carried approving of the Bill for the Amalgamation of the Piccadilly, Baker Street and Waterloo, and the Charing Cross and Hampstead Railways; the Bills being promoted by the Charing Cross Co. and the Baker Street Co. for railway works; and the Bill of the Metropolitan District Co. for the capitalisation of arrears of dividend.

City of Buenos Ayres Tramways Co. (1904), Ltd.—At the meeting last week Mr. John Heaton, the chairman, said that the position was satisfactory. The annuity payable by the Anglo-Argentine Tramways had been received, and the net revenue amounted to £65,842. This was the fifth year since the arrangement was arrived at whereby annuities were paid to them by the Anglo-Argentine Tramways Co.

South Metropolitan Electric Light and Power Co., Ltd.

The directors' report for the year ending December 31st, 1909, states that the revenue account shows a credit balance of £25,382, which, with £6,493 brought forward, makes a total of £31,875. After deducting £10,963 for interest on debenture stock paid and accrued, and for other interest, £5,004 for interim dividend paid on the 7 per cent. cumulative first preference shares, and £485 for interim dividend paid on the 6 per cent. cumulative second preference shares, there remains a balance of £15,423, which the directors recommend be dealt with as follows: Final dividend to December 31st, 1909, upon the 7 per cent. cumulative first preference shares, £5,004; final dividend to December 31st, 1909, upon the 6 per cent. cumulative second preference shares, £1,312; to credit of depreciation account, £6,500; to credit of preliminary expenses, £1,500; the balance of £1,106 being carried forward. The following comparative figures show the progress of the company's business:—

Year.	35-watt lamps connected at end of year.	Increase.	No. of consumers.	Gross revenue.	Expenditure.	Net revenue.
1907 ..	160,380	15,668	3,383	£43,302	£16,234	£27,068
1908 ..	177,628	17,248	3,649	42 954	15,978	26,976
1909 ..	191,302	13,674	3,916	41,847	16,465	25,382

The increase in the number of new orders has been maintained, but the revenue is less owing to the great saving to consumers of electricity by the increasing use of metal-filament lamps. Energetic steps have been taken to bring the advantages of the electric light before occupiers of smaller properties in the thickly populated districts, and also to develop the more general use of electricity. Model houses have been opened at Hither Green and Catford, which have excited public interest and have formed the subject of numerous articles in the Press. A large number of local residents and others have visited these houses, and new orders are now being obtained more rapidly than hitherto. In order to meet the requirements for supply in an adjoining district, the West Kent Electric Co., Ltd., was registered, and has taken over certain of the powers of the Kent Electric Power Co., Ltd., for an area between Northfleet, Sevenoaks and London. An agreement has been entered into to give a bulk supply, and arrangements have been made for the company to work the undertaking and to subscribe £10,000 share capital of the West Kent Electric Co., Ltd., one half of which will be called up and will be used for repayment of disbursements made by the company and for laying mains for the supply of electricity for lighting and power in part of the Bromley rural district, where a number of orders have already been obtained.

Western Electric Co. (Chicago).

This company's annual meeting was recently held in Chicago. According to an abstract of the president's report appearing in the *Electrical Review and Western Electrician*, the company's sales for the fiscal year ending on November 30th, 1909, were $45,575,000, as compared with $32,314,000 for the previous year, an increase of 41 per cent. For 1909 the number of orders received in America was 695,000, as compared with 572,000 for 1908, and the average value of an order for 1909 was $62 00, as compared with about $47·00 for 1908. The net earnings for the year, after deductions for depreciation on plant and merchandise and interest paid, were $2,089,000, which is 13·9 per cent. on the capital stock. Dividends to the amount of $1,200,000 were paid from these earnings, and the balance was added to the surplus.

"The company has turned over its patents, tools and patterns used in the manufacture of machinery for power and lighting to the General Electric Co., with whom an arrangement has been made to manufacture a line of this apparatus which will be sold by the Western Electric Co. It has seemed best to make such an arrangement, both because of the growing demand for capital to keep up with the growth of the power apparatus business, and because the increased demand for telephonic apparatus points to a greater demand for capital. On December 1st, 1909, the number of employés was 17,848, as compared with 14,449 on December 1st, 1908."

London Electric Supply Corporation, Ltd.

The directors' report for the year ended December 31st, 1909, states that the profit on the working for the year is £50,686, against £53,209 last year, to which is added £3,408 brought forward, less interest on temporary loan, viz., £2,569, making a total of £51,525. Out of this the interest on debenture stock to December 31st, viz., £15,494, has been paid, leaving a balance of £36,031 to be appropriated. The board propose to pay a dividend of 6 per cent. on the preference shares (of which an interim dividend of 3 per cent. was paid on September 1st, 1909), viz., £20,952, a dividend of 2 per cent. on the ordinary shares, £6,660, and to place to reserve account (making a total of £67,500) £5,000, carrying forward £3,419. The supply has been efficiently maintained during the year. The number of units sold amounted to 10,308,537, as against 13,160,130 last year. The contract with the London County Council for the supply of power for their tramways expired in June last. The number of units supplied to them for this purpose during the year was 994,500, as against 5,401,500 last year—a decrease of 4,407,000 units, amounting in gross receipts to £16,158. Considering this large decrease, the board think the result of the year's working, which only shows a decrease in revenue of £2,523 as compared with last year, is satisfactory. This is largely owing to the greater efficiency and economy in working. The London, Brighton and South Coast Railway opened their new electric service to the public on December 1st last. From that date until now the power supply has been maintained without a failure or mishap of any kind. The following is an extract from the Earl of Bessborough's speech at the general meeting of the railway held on 2nd inst.:—

> He believed he was right in saying that this was the first recorded instance where electrical traction, established on an ordinary steam railway, had worked from the commencement so smoothly and uninterruptedly, and in this connection it was only fair to acknowledge the ready co-operation and help of the London Electric Supply Corporation, the contractors for the supply of current, and the efficiency and regularity with which their part of the task had been performed.

The safety, economy and efficiency of the single-phase system having been so satisfactory, the railway company are considering the electrification of other portions of their system, and negotiations are now proceeding with them for a further contract for the supply of power for such extensions. The plant and machinery have been maintained out of revenue, and are in an efficient condition.

Waste Heat and Gas Electrical Generating Stations, Ltd.

The directors' report to be presented at the third annual meeting at Newcastle-upon-Tyne, on Monday, February 28th, states that the profits earned by the company during the year ended January 31st, 1910, after deducting administration and other expenses, and an amount of £256 for interest on calls on shares paid in advance, amount to £16,475. Out of this sum the directors have transferred to reserve for depreciation and other purposes £4,000, and have also written off the brokerage paid on the issue of capital in February last year, £865, leaving £11,610, plus £913 brought forward, making £12,523. The directors propose a dividend at the rate of 7 per cent. for the year, which will absorb £8,920. Out of this an interim dividend was paid in August, 1909, amounting to £2,750, leaving to be carried forward £3,603. It is proposed to pay the balance of the dividend on March 1st, less income-tax. The Weardale and Newport generating stations have been running satisfactorily and to their full capacity throughout the year. The Tees Bridge generating station, although completed in the early part of the year, has not yet been running regularly, but it is hoped that the company will derive full benefit from this station also in the coming year. The expenditure on capital account during the year has amounted to £13,941, and other available cash in hand has been deposited at interest with contractors on account of the contracts not yet entirely completed. The company also applied for, and were allotted, 19,996 shares of £1 each in the Bankfoot Power Co., Ltd., in accordance with the agreement referred to in the last report, and this investment, which was taken up in March, 1909, has already yielded a satisfactory return. As a result of the prospectus which was issued by the directors in February, 1909, inviting subscriptions for £65,000, the whole of which was taken up, the issued and subscribed capital of the company is now £150,000 shares of £1 each. Under the company's agreement with the Weardale Steel, Coal and Coke Co., Ltd., that company are now entitled to apply and pay for in cash, at par, 10,000 £1 shares in this company. This application having been received, and in order that the shares may be forthwith allotted, the directors propose to increase the authorised capital of the company by a further £100,000, £10,000 of which will be issued to the Weardale Steel, Coal and Coke Co., Ltd. The balance will only be issued when required for the further development of the company's business. The shareholders will be asked to pass a resolution to authorise this increase of capital at the general meeting. A contract has been entered into for the extension of the Newport generating station, which will provide a further 1,600 kw. of plant capacity.

Kensington and Knightsbridge Electric Lighting Co., Ltd.

The directors, in their report on the position of the undertaking at the end of the year 1909, state that the renewal and reserve fund account now stands at £85,464, being an increase of £7,268 over 1908. After providing for the amount placed to renewal and reserve fund account, and after paying the dividends on the 6 per cent. first preference shares to June 30th, 1909, on the 5 per cent. second preference shares to September 30th, 1909, and an interim dividend at the rate of 8 per cent. per annum on the ordinary shares for the first half of the year, the balance standing to the credit of the net revenue account for the year 1909, is £8,081. Of the above sum £1,500 has been appropriated to the payment of the first preference dividend to the end of the year, and £625 has to be set aside to meet the portion of the dividend on the second preference shares accrued to the same date. It is proposed to pay out of the balance of £5,956 a further dividend on the ordinary shares at the rate of 8 per cent. per annum, for the past half-year, making with the interim dividend paid on August 12th, 8 per cent. for the year. This will leave £1,756 to be carried forward.

National Electric Supply Co., Ltd.—In our report of this company's meeting last week, the name of the chairman was wrongly given. Mr. John Booth presided at the meeting, not Mr. Pyke, and he stated that £4,000 had been expended upon mains during the year, not £40,000.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	Receipts for the fortnight. £*	No. of wks.	Total to date. £	Total to date. £*	Route miles open.	Inc.
Aberdeen	Feb. 16	2,364	+ 28	37	51,348	— 882	..	..
Ayr	" 19	260	+ 11	40	11,757	— 160	8	..
Bath	" 19	1,288	+ 131	7	4,590	+ 428	..	..
Belfast	" 18	7,501	+ 580	45	176,892	+ 6,608	37	..
Birkenhead	" 20	1,965	+ 38	46	49,811	+ 60	13·63	..
Birmingham Corp.	" 12	13,732	+1,203	46	304,243	+11,588	56·45	..
Blackburn	" 16	1,808	— 120	46½	50,332	— 1,530	14·12	..
Blackpool Corp.	" 17	750	+ 53	..	53,029	+ 4,995	..	..
Blackpool-Fleetw'd	" 19	415	— 33	7	1,504	— 170	..	..
†Bolton	" 20	2,178	+ 2	47	108,825	+ 810	26	..
Bournemouth	" 16	2,756	+ 286	46	75,857	+ 1,397	21·93	..
Bradford	" 12	9,169	+ 783	45	220,353	+ 8,622	54·81	..
Brighton	" 20	1,458	+ 110	46½	44,399	+ 2,166	9·5	..
Bristol	" 18	10,542	+1,105	..	..	..	..	..
Brit. Elec. Trac. Co.								
Airdrie	" 11	415	— 20	6	1,500	+ 26	3·65	..
Barnsley	" 11	325	+ 15	"	958	+ 7	..	..
Barrow	" 11	466	+ 67	"	1,283	+ 115	5·87	..
Cavehill	" 11	106	— 3	"	304	— 10	..	..
Devonport	" 11	783	+ 65	"	2,456	+ 54	8·85	..
Gateshead	" 11	1,838	— 110	"	5,584	— 111	11·25	..
Gravesend	" 11	342	+ 2	"	1,072	+ 44	6·5	..
Greenock	" 11	959	+ 77	"	2,880	+ 299	7·25	..
Hartlepool	" 11	396	+ 21	"	1,185	+ 29	6·72	..
Kidderminster	" 11	155	+ 4	"	476	+ 13	..	..
Leamington	" 11	250	— 15	"	804	— 18	..	..
Merthyr	" 11	365	— 23	"	1,093	— 78	2·9	..
Metropolitan	" 11	12,365	+1,913	"	37,450	+ 6,015	23	..
Middleton	" 11	478	— 83	"	1,470	— 180	8·5	..
Mid. Joint Com'tee	" 11	10,796	+ 321	"	31,164	+ 518	..	..
Oldham—Ashton	" 11	964	— 74	"	2,919	— 107	9·13	..
Peterborough	" 11	184	— 2	"	559	+ 14	5·31	..
Potteries	" 11	3,343	— 42	"	10,011	— 188	29	..
Rothesay	" 11	69	— 8	"	262	+ 16	2·75	..
Southport	" 11	405	— 23	"	1,282	— 73	8·17	..
S. Metropolitan	" 11	1,318	+ 34	"	4,087	+ 161	..	..
Swansea	" 11	1,852	+ 179	"	5,674	+ 629	12·5	..
Tynemouth	" 11	255	+ 14	"	818	+ 76	3·75	..
Weston-s-Mare	" 11	50	+ 4	"	155	— 1	3	..
‡Worcester	" 11	454	+ 18	"	1,388	+ 30	5·75	..
Wrexham	" 11	158	— 18	"	506	— 21	..	..
Yorks. Wool. Dist.	" 11	1,759	+ 70	"	5,307	+ 345	17	..
Miscellaneous	" 11	357	+ 1	"	1,096	+ 49	..	..
Burnley	" 19	2,328	+ 70	..	..	..	..	..
Burton-on-Trent	" 20	499	+ 32	47	12,361	— 92	6·62	..
†Bury	" 20	1,005	+ 2	46½	53,218	— 300	22·5	..
Cardiff	" 12	4,100	+ 240	46	100,445	+ 2,183	..	..
Carlisle	" 19	300	+ 18	7	1,044	..	..	..
Chatham and Dist.	" 17	1,468	+ 91	7	5,110	+ 195	14·98	..
Cork	" 17	844	+ 68	..	2,518	+ 12	9·89	..
†Croydon	" 4	1,480	+ 263	..	70,338	+ 7,710	11·25	4·76
Darlington	" 19	363	— 34	47	8,623	— 501	..	..
Darwen	" 18	444	— 3	46	11,381	— 135	4·36	..
†Dover	" 19	159	+ 23	47	9,578	— 235	4·75	..
Dublin	" 18	9,994	+ 511	..	84,698	+ 153	54·26	..
Dundee	" 16	2,265	— 55	39½	46,775	— 785	15·5	..
East Ham	" 19	1,879	+ 184	46½	46,454	+ 5,287	8·52	·77
Exeter	" 18	531	+ 31	47	15,232	+ 712	5·5	..
Glasgow	" 19	33,793	—1,235	..	636,449	— 6,406	94½	5
Hastings	" 17	1,375	— 26	..	..	..	..	..
Huddersfield	" 12	3,242	+ 329	45	75,779	+ 4,294	28·5	·5
Hull	" 19	5,336	+ 501	46	121,928	+ 6,248	14·5	1·5
†Ilkeston	" 17	117	— 7	46	6,108	— 247	..	..
Ipswich	" 19	640	+ 59	47	18,289	+ 366	10·5	..
Kilmarnock	" 12	139	+ 7	39	5,601	— 246	4·5	..
Lancashire United	" 16	2,482	— 11	..	7,919	+ 363	39	..
†Leeds	" 19	6,615	+ 604	46	315,223	+10,624	..	..
Leicester	.. ..	..	..	..	..	..	..	..
Leith	" 19	1,078	+ 117	39½	23,322	+ 2,677	9	3
Liverpool	" 12	20,937	+ 381	6½	64,593	+ 851	109·5	2
‡L.C.C.	" 5	74,700	+10,924	..	1,664,695	+19,194	..	..
London United	" 19	10,509	+ 806	..	37,346	+ 2,256	..	..
†Lowestoft	" 19	125	+ 6	21	3,213	+ 166	3·5	..
Manchester	" 19	29,791	+1,458	47	693,543	— 4,432	..	..
Newcastle	" 19	7,601	— 16	..	181,358	— 1,322	14·5	..
†Newport	" 19	614	+ 56	47	10,562	+ 191	14·5	..
Oldham	" 20	3,243	— 367	47	84,379	— 7,645	24·75	..
†Pontypridd	" 19	388	+ 17	46½	18,956	+ 1,206	5·5	..
†Portsmouth	" 19	1,593	+ 125	47	94,913	+ 3,563	15·26	·75
Preston	" 16	1,888	+ 57	..	..	..	..	..
Rotherham	" 3	1,060	— 25	44	26,087	— 992	12	2
Salford	" 14	8,645	+ 323	44½	207,491	— 3,118	..	..
Sheffield	" 20	10,541	+ 824	46½	263,183	+ 5,867	39·62	2·62
†Southampton	" 9	982	+ 77	45	48,126	+ 178	..	..
Southend-on-Sea	" 15	706	+ 135	46	23,569	+ 3,301	..	..
South Shields	" 19	1,022	+ 33	46½	26,009	+ 89	..	..
†Swindon	.. ..	..	..	..	..	..	..	..
Tyneside	" 16	714	— 41	7	2,828	— 233	..	..
Wallasey	" 19	1,585	+ 52	46½	42,043	+ 845	..	..
Walthamstow	" 19	1,137	+ 160	47	30,295	+ 1,338	9	..
West Ham	" 10	4,448	+ 263	45½	106,322	+ 7,082	15·25	..
Wolverhampton	" 16	1,716	+ 284	46	39,302	+ 1,617	12·5	1·75
Baker St.-Waterloo	" 19	6,855	+ 50	7	24,440	+ 355	4·25	..
Cen. London Rly.	" 19	11,105	+ 9	7	38,914	— 610	6·62	·55
Char. +, Ens. Harmg.	" 19	7,480	— 255	7	26,830	— 110	7·75	..
City & S. Lon. Rly.	" 20	6,647	— 7	7	23,439	— 404	7·2	..
Dublin-Lucan Rly.	" 16	212	— 1	7	692	— 70	7	..
G.N. and City Rly.	" 19	3 081	— 91	7	11,041	— 192	3.5	..
G.N., P'y. & Brmin.	" 19	13,905	— 490	7	42.995	+ 355	9·25	..
L'pool Overh'd Rly.	" 20	2,569	+ 62	..	10,254	— 259	6·6	4·3
†Llandudno-Col. Bay	" 11	113	+ 6	10½	1,188	+ 78	..	..
Mersey Railway	" 19	3,908	+ 30	7	13,890	+ 191	4·5	..
Metropolitan Rly.	" 20	32,590	+ 961	..	115,734	+ 3,590	24·5	..
Met. District Rly.	" 19	21,478	+1,687	7	75,258	+ 6,068	24	..
Anglo-Argentine	" 18	84,647	+6,756	..	296,868	+25,865	..	..
‡Auckland	Jan. 28	14,972	+1,261	..	..	..	22·3	1·38
Bombay (B.E.T.)	" 20	5,412	+ 381	8	12,830	+ 830	..	..
‡Brisbane	.. ..	..	..	..	..	..	..	..
‡Brit. Columbia Rly.	.. ..	..	..	..	..	..	..	..
Calcutta	Feb. 19	67,185	— 178	..	..	..	..	..
‡Cape Electric T. Ld.	.. ..	..	..	..	..	..	..	..
‡Kalgoorlie, W.A.	Jan.	3,172	..	..	3,172	..	30·5	..
Madras	Feb. 15	1,330	..	..	4,240	+ 106	..	..
‡Lisbon	.. ..	..	..	..	..	..	..	..
Perth (W.A.)	" 18	3,118	+ 165	..	11,294	+ 594	38	

* Compared with the corresponding period of 1909. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Afternoon.

POLITICS are to the Stock Exchange an unmitigated nuisance. When they come into the financial focus, it means that there is trouble about somewhere. The present political crisis acts as a weight upon investment prices, and the public won't take any active interest in gilt-edged securities while the uncertainty lasts.

Some of the speculative departments are, however, active enough, especially the rubber share market, which pursues its merry way untroubled by the appearance of a fresh aspirant for general favour in the shape of an oil gamble.

Prices of rubber shares are well maintained, and the volume of new rubber companies shows not a sign of slackening. It would, indeed, be remarkable if promoters were able to resist the temptation of launching fresh concerns at a time when all the good shares are avidly run after, and subscription lists are closed an hour or two after opening. Substantial premiums on new issues are common as February gales, and the older companies' shares continue to advance in a manner little short of marvellous.

A new issue of another kind of business was provided last week by the United Electric Theatres, Ltd., which offered 106,000 shares of half-a-sovereign each. It is to be hoped that the prudent investor made no wild rush for the shares.

In the Home Railway market, almost the only stocks to show any degree of strength are the Central London issues, all of which show advances. This is owing, of course, to the hope that the Anglo-Japanese Exhibition at Shepherd's Bush in the summer-time will prove as great a success as was the Franco-British two years ago.

The Debenture stocks of the three Tube-Amalgamation companies—Bakerloo, Charing Cross and Euston, and Great Northern, Brompton and Piccadilly—have come into line at 96, as the middle price for them all, the necessary consent of proprietors having been obtained, and only formalities remaining to render the consolidation complete. It may be worth while to point out that the 4 per cent. Preference of the Great Northern and Piccadilly Tube stand at 8½ for the £10 fully-paid shares, and carry a dividend of 4s. per share, payable this month. On the basis of $8\frac{5}{16}$ *ex* dividend, the yield to an investor is £4 16s. 3d. per cent. on the money.

Metropolitan Consolidated stock is lower, and so is the District Ordinary, though Metropolitan Surplus Lands gained a point. Both classes of bonds in the Underground Electric Railway Company have been advanced. London United Tramway Preference shares are better, but the Debenture stock has somewhat declined. British Electric Traction First Debenture rose 1; the company's Preference shares are 10s. lower.

Active dealings in the Canadian-South American group have resulted in higher prices being quoted for Mexico Tramp, Mexico Light and Power, Rio Trams (at 96½), and some of the others. The various companies' 5 per cent. First Mortgage bonds are improving in sympathy with the ordinary stocks, and in connection with the former, it may be well to repeat that the $500 bonds are equal to £102 14s. 10d. English money, but the price is worked out at so much per £100. We have already commented upon this as liable to give rise to some confusion in the mind of the investor, who does not at first realise that the coupons are calculated and paid on the $500, and that, in selling, he gets the advantage which he considers a handicap when buying.

Publication of the profits and declaration of dividends on the part of the London electric supply undertakings have drawn a little attention to the shares in this market, although it cannot be said that the movements are dramatic. Kensingtons, Bromptons, Citys and Edmundson's Preference are better; St. James's Preference are 2s. 6d. down, and Smithfields fell as much as 7s. 6d. Rosario Electric Second Preference lost ½ of their big rise of the previous week, the price receding to 8½, while the Firsts kept about 6½. River Plate shares have been bought on the idea that the proprietors will benefit by reason of the River Plate's holding of Rosario Ordinary shares. It seems probable, however, that the River Plate Company will make no distribution of its windfall, but devote the money to putting the balance-sheet into a yet stronger position. The Ordinary shares are 2s. 6d. higher at 35s., and the Debenture stock at 103½ is 1 up.

Telegraph and telephone descriptions are rather ignored in the rush for the more popular stocks and shares. The main feature is a further sharp fall in Anglo-American Deferred, it being rumoured that the company's cables have suffered in the week-end gale. Great Northerns are good. Cuba Telegraphs are lower. Eastern Extension and West India and Panama show small improvements, and Globe Ordinary gained half-a-crown. Indo-Europeans are £1 higher. In the telephone list, National Deferred is again better, and United River Plate Preference continue to harden. New York Telephone 4½ per cent. bonds rose to 102, and American Telephone Capital stock put on 3 points.

Amongst the Miscellaneous shares, Callenders and Henleys have scored rises, Henleys on the repetition of the usual 15 per cent. dividend. Dick, Kerr shares are a little lower, and Babcock Ordinary fell ½ on profit-taking after their recent steady rise. Telegraph Constructions are strong on the increase in the dividend. Marconis show a small rise.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1906.	1907.	1908.	1909.	Closing Quotations Feb. 15th.	Closing Quotations Feb. 22nd.	Business done week ended Feb. 22nd, 1910. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	..	3⅜ — 3¾	3⅜ — 3¾	..	..	..	Nil.
136,700	Do. do. 5 % Debs., Nos. 1 to 1,200 Red.	100	5 %	5 %	5 %	5 %	99 —102	100 —102	..	..	+1	4 18 0
$131,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	8 %	8 %	8 %	8 %	140 —142	143 —145	..	..	+3	5 10 4
$53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	94 — 96	94 — 96	..	..	..	4 3 4
558,460	Anglo-American Telegraph	Stock	3¼%	3¼%	£3 4s.	3¾%	59 — 61 xd	58½— 60½	..	..	— ½	5 19 10
3,220,770	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	99½—100½ xd	99½—100½	100½	99½	..	5 19 1
3,220,770	Do. do. do. Deferred	Stock	1¾%	1 %	8/-	25/-	18½— 19 xd	17½— 18½	18½	17½	— ½	6 17 0
47,725	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	..	101½—102½	101½—102½	..	..	..	4 16 7
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	7⅛— 8⅛	7⅛— 8⅛	..	..	..	4 16 8
2,481,850	Commercial Cable, Sing. 600 year 4% Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	85½— 86½	85½— 86½	87½	85½	..	4 10 5
15,000	Cuba Telegraph	10	5 %	6 %	6 %	..	8½— 9½	8½— 9½	8¾	8¼	..	6 9 9
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	..	17 — 18	16½— 17½	16½	..	— ½	5 12 8
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	..	3 — 3½	3 — 3½	..	..	..	5 14 8
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	..	8 — 8½	8 — 8½	..	..	..	6 5 0
80,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 8
80,710‡	Direct United States Cable	20	4½%	4½%	4½%	..	13½— 14½	13½— 14½	15½	..	..	5 19 1
89,500‡	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,300, R.	100	4½%	4½%	4½%	4½%	99½ —101½	99½ —101½	..	..	..	4 8 8
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	..	135 —138	135 —138	136½	136	..	5 1 5
2,000,000	Do. 5½ % Pref. Stock	100	5½%	5½%	5½%	5½%	86 — 88	86 — 88	86½	87½	..	4 1 5
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	102½—104½	102½—104½	..	..	..	3 16 7
800,000	Eastern Extension, Australasia, and China Tele	10	7 %	7 %	7 %	..	12½— 13	12½— 13	12½	12⅝	+ ⅛	5 7 8
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	101 —103	101 —103	..	..	..	3 17 8
200,000‡	East. & S. Afric. Tel., 4 % Mt Db. Mauritius Sub.) 1 to 5,000	25	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 3
181,127	Globe Telegraph and Trust	10	5½%	5½%	5½%	..	10⅜— 10⅞	10½— 11	10⅝	10⅜	+ ⅛	5 4 7
181,127	Do. do. 6 % Pref...	10	6 %	6 %	6 %	..	13⅜— 13⅝	13⅜— 13⅝	13½	13⅛	..	4 6 6
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	20 %	20 %	18 %	..	29½— 30½	29½— 30½	..	..	+ ½	5 17 1
5,000‡	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,900, Red.	100	4½%	4½%	4½%	4½%	99½—101½	99½—101½	..	..	..	4 8 8
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	..	51 — 53	52 — 54	..	..	+2	6 18 11
$41,880,400	Mackay Companies Common	$100	5½%	4 %	4 %	4½%	91 — 93	92 — 94	..	..	+1	4 10 5
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	77 — 82	77 — 82	..	..	..	4 17 7
894,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	3⅛— 3⅜	⅛— ⅛	..	..	+ ⅛	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	6 %	6 %	6 %	..	¾— 1	¾— 1	..	..	+ ⅛	6 0 0
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	..	⅜— ½	⅜— ½	..	..	..	5 6 8
2,235,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	107½—109	107½—109	108½	107½	..	5 10 1
3,735,000	Do. do. Def. Stock	100	5 %	6 %	6 %	6 %	126 —128	127 —129	129	127	+1	4 13 0
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½— 11½	10½— 11½	..	..	..	5 6 8
15,000	Do. do. 6 % Cum. 2nd Pref.	10	5 %	6 %	6 %	6 %	10½— 11	10½— 11	10⅝	10⅝	..	5 9 1
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5½— 5⅝	5½— 5⅝	5⅝	..	..	4 6 11
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	98 — 100	98 —100	..	..	..	3 10 0
1,988,593	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	100 —102	100 —102	101½	100½	..	3 18 5
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	7 %	8 %	8 %	..	1⅜— 1½	1⅜— 1½	1⅝	..	..	5 5 9
50,000	Do. do. do. 6 % Cum. Pref... ..	1	6 %	6 %	6 %	..	1⅜— 1⅝	1⅜— 1⅝	..	..	..	4 14 9
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	4 %	4 %	4 %	4 %	86 — 88	86 — 88	..	..	..	4 10 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	98 —100	98 —100	..	..	..	4 0 0
11,889	Reuter's	8	5 %	5 %	5 %	..	7⅞— 8¼	7⅞— 8¼	..	..	..	4 18 9
145,955	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	101½	..	..	4 8 3
3,042	Submarine Cables Trust	Cert.	6 %	6 %	6 %	..	130 —133	130 —133	..	..	..	4 10 3
120,000	United River Plate Telephone	5	8 %	8 %	8 %	..	7⅞— 7⅞	7⅞— 7⅞	7⅞	..	..	5 7 9
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	..	4⅞— 5⅛	4⅞— 5⅛	5⅛	..	+ ⅛	4 16 7
80,008	W. Coast of America, 1 to 80,000 & 53,001 to 53,008	2½	2½%	2½%	2½%	..	1⅜— 1⅝	1⅜— 1⅝	..	..	..	3 16 4
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Bras. Sub. Tel.	100	4 %	4 %	4 %	4 %	98 —100	98 —100	..	..	..	4 0 0
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980.. ..	10	7 %	7 %	7 %	..	13⅜— 14½	13⅜— 14½	..	..	..	4 18 3
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	101 —103	101 —103	102½	101	..	3 17 8
88,821	West India and Panama Telegraph	10	Nil	Nil	Nil	..	⅛— ⅜	⅜— ⅝	16/-	1⅛/-	+ ⅛	Nil
84,568	Do. do. 6 % Cum. 1st Pref.	10	8 %	6 %	6 %	..	8⅛— 9⅛	8⅛— 9⅛	8¼	..	..	6 9 9
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	£3 6	15 %	..	8 — 9	8 — 9	..	..	..	6 18 4
80,000‡	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	100½—102½	100½—102½	..	..	..	4 17 7

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

640,000	Anglo-Argentine Trams, 5 % Cum. 1st Pref., 1 to 640,000	5	..	..	..	..	4¼ — 4½	4¼ — 4½	93/1½	90/10½	..	5 5 5
800,000	Do. 5 % 2nd Pref., 800,001 to 1,800,000	5	..	..	..	..	4¼ — 4½	4¼ — 4½	85/-	83/9	..	5 14 3
4,465,674	Do. 4 % Deb. Stock	Stock	..	..	4 %	4 %	90½ — 92	90½ — 92	91½	91¼	..	4 7 0
332,387	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	104 —106	104 —106	..	..	..	4 14 4
300,000	Babcock & Wilcox, 1 to 300,000	1	20 %	20 %	20 %	..	5⅞— 5⅞	4⅞— 4⅞	5⅛	5	..	3 16 11
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	..	1⅛— 1⅛	1⅛— 1⅛	..	..	..	3 19 2
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	Nil	..	⅜— ⅜	⅜— ⅜	25/-	24/9	..	Nil
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	3½%	..	⅝— 1⅛	1 — 1⅛	..	..	+ ⅛	..
40,100	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	..	2⅛— 2½	2⅛— 2½	..	..	..	..
12,897	Do. do. 4 % Funding Certs.	5	4 %	4 %	2 %	..	1⅝— 1⅞	1⅝— 1⅞	..	..	..	..
124,400	Do. do. 5½ % Loch Leven Debs. ..	100	5½%	5½%	5½%	5½%	95 — 98	95 — 98	..	..	..	..
600,000	British Columbia E. Rail Def. Ord. Stock	100	6 %	8 %	8 %	8 %	139 —143	139 —143	..	..	..	5 11 11
400,000	Do. Pref. Ord. Stock	100	5 %	5 %	6 %	6 %	116 —120	117 —121	119½	..	+1	4 19 2
400,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	109 —111	109 —111	111	110⅝	..	4 10 1
238,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	4½%	4½%	4½%	4½%	102 —104	102 —104	102	..	..	4 6 7
212,600	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
138,801	British Electric Traction	10	Nil	Nil	Nil	..	1 — 1⅛	1 — 1⅛	25/-	24/-	..	Nil
161,487	Do. do. 6 % Cum. Pref.	10	6 %	3 %	1½%	..	3½— 3¾	2⅝— 3¼	65/-	61/3	— ⅛	4 12 4
1,478,658	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	..	89 — 92	90 — 93	91½	91	+1	5 7 6
528,986	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	..	68 — 73	68 — 73	..	..	..	6 6 6
100,000	British Insulated and Helsby Cables	5	10 %	10 %	10 %	..	7⅞— 7⅞	7⅞— 7⅞	7⅞	7⅞	..	6 9 0
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6⅜— 6⅝	6⅜— 6⅝	..	..	..	4 10 7
600,000	Do. do. 4½ % 1st Mort. Deb. Red...	100	4½%	4½%	4½%	4½%	103 —106	103 —106	..	..	..	4 4 11
104,940‡	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	89 — 94	89 — 94	..	..	..	4 15 9
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 75,000	5	Nil	Nil	Nil	..	½— ¾	½— ¾	..	..	..	Nil
1,616,852	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	..	47 — 51	47 — 51	..	..	..	7 16 10
60,000	‡Brown, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	⅝— 1⅛	⅝— 1⅛	..	..	..	Nil
60,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 106,731 ..	2	Nil	Nil	Nil	..	0 — ⅛	0 — ⅛	..	..	..	Nil
200,000	Do. do. Non-cum. 6 % Pref.	2	Nil	Nil	Nil	..	0 — ⅛	0 — ⅛	..	..	..	Nil
135,000‡	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	..	41 — 46	41 — 46	..	..	..	9 15 8
135,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	..	25 — 29	25 — 29	..	..	..	15 3 0
197,610	Calcutta Trams, 1 to 197,610	5	8 %	6 %	4½%	..	4¼— 4¾	4¼— 4¾	..	..	..	4 14 9
45,804	Do. 5 % Cum. Pref., Nos. 1 to 29,380..	5	5 %	5 %	5 %	..	4¾— 5	4¾— 5	..	..	..	5 0 0
850,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	98 —101	98 —101	..	..	..	4 9 1
85,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	..	10¼— 10¾	10½— 11	10⅝	..	+ ⅛	6 0 0
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5⅜— 5½	5⅜— 5½	5½	..	..	4 10 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	102½—104½	102½—104½	7/-	..	..	4 6 2
491,223	Cape E. Trams., 1 to 491,223	1	Nil	Nil	Nil	..	⅛— ¼	⅛— ¼	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	8 %	12 %	12½%	..	2⅜— 2⅝	2⅜— 2⅝	49/6	48/1½	..	5 0 0
210,153	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4 %	4½%	104 —107	104 —107	..	..	..	4 4 1
1,890 690	Central London Railway, Ord. Stock	Stock	4 %	3 %	3½%	3 %	63 — 65	65 — 67	66½	65	+2	4 9 7
554,655	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	84 — 86	86 — 87	86	..	..	4 13 0
554,655	Do. do. Def. do.	Stock	4 %	3 %	2½%	2 %	44 — 46	45 — 47	44½	..	+1	4 5 1
1,480,000	City and South London Railway	Stock	3½%	3½%	1½%	1½%	30½ — 31½	30½ — 31½	30½	..	..	5 11 1
85,000	Crompton & Co., Nos. 1 to 85,000	5	5 %	5 %	Nil	..	⅜— ⅝	⅜— ⅝	..	..	..	Nil
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 11,000 of £50 Red	..	5 %	5 %	5 %	5 %	88 — 91	88 — 91	..	..	..	5 9 11

* Unless otherwise stated, all shares are fully paid ‡ From Manchester Share List.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1906.	1907.	1908.	1909	Closing Quotations Feb. 15th,	Closing Quotations Feb. 22nd.	Business done week ended Feb. 22nd. 1910. Highest.	Lowest.	Rise + or Fall —	Present Yield per cent.
		*										£ s. d.
£80,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	6 %	..	1 — 1⅛		22/-	20/-	— 1/32	5 19 8
805,000	Do. do. 6 % Cum. Pref., 1 to 805,000	1	6 %	6 %	6 %	..	1⅞ — 1⅞	1⅞ — 1⅞	..	..	..	5 9 1
271,080	Do. do. 4½ % Deb. Stock	100	4½	4½	4½	4½	99 —102	99 —102	..	..	..	4 8 3
60,000	Dublin United Trams. (1896), 6 % Pref., 1 to 60,000	10	6 %	6 %	6 %	6 %	13 — 14 xd	13 — 14	..	..	..	4 7 8
99,961	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,961	5	4½	2½	Nil	..	5/16 — 3/8	5/16 — 3/8	..	..	..	Nil
17,189	Do. "A" shares, 01—017,189	5	4½	2½	Nil	..	1 — 1⅛	1 — 1⅛	..	..	..	Nil
207,895	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	64 — 69	64 — 69	68	..	..	5 15 11
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	..	81 — 84	81 — 84	..	..	..	5 19 1
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
31,890	Do. do. 7 % Cum. Pref., 1 to 31,890	2	7 %	7 %	7 %	..	1⅛ — 1⅛	1⅛ — 1⅛	..	..	..	10 4 0
95,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	7⅞ — 8⅛	7⅞ — 8⅛	..	..	..	6 1 3
2 10,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	..	83 — 87	83 — 87	..	..	..	4 12 0
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	1½	Nil	..	3/8 — 1/2	3/8 — 1/2	..	..	..	Nil
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	..	..	10½ — 10⅝	10½ — 10⅝	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	..	102 — 103	102 —103½	..	..	..	4 16 10
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	5 %	15%	15 %	..	12½ — 13	12½ — 13½	..	..	+ ½	5 12 2
40,000	Do. do. 4½ % Pref.	5	4½	4½	4½	..	5 — 5⅛	5⅛ — 5⅛	..	..	+ 1/16	4 3 9
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½	4½	4½	..	105½ —107½	105½ —107½	..	..	..	4 3 9
80,000	India-Rubber, Gutta-percha & Telegraph Works	10	0 %	10 %	10 %	10 %	15 — 15½	15⅛ — 16	15⅞	15⅛	+ ⅛	6 5 0
97,500	†Liverpool Overhead Railway, Ord.	10	Nil	½%	Nil	Nil	1⅜ — 1⅝	1⅜ — 1⅝	..	..	..	Nil
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	4½ — 5½	4½ — 5	..	..	..	9 10 6
600,070	London United Trams. (1901), 1 to 50,007	10	3 %	3 %	Nil	..	1⅛ — 2⅛	1⅛ — 2⅛	..	..	..	Nil
599,980	Do. do. 50,008 to 100,000	10	3 %	3 %	Nil	..	1⅛ — 2⅛	1⅛ — 2⅛	..	..	..	Nil
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	32½ %	..	1⅛ — 2⅛	2⅛ — 2⅝	41/8	..	+ ⅛	13 12 8
1,649,980	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	..	4 %	4 %	71 — 74	70 — 73	71	..	—1	5 9 7
5,732,029	Metropolitan Consolidated	100	1 %	1%	1 %	1 %	38⅜ — 39½	38⅜ — 39	39½	38½	— ½	2 13 8
2,640,914	Do. Surplus Lands	100	2½%	2½%	2½%	2½%	66 — 68	67 — 69	70	67½	+1	3 19 9
3,235,000	Do. District	100	Nil	Nil	Nil	Nil	17⅛ — 17⅞	17 — 17⅝	17⅞	17⅛	..	Nil
891,337	Metropolitan Electric Trams., Ord.	1	..	..	4½%	..	1⅛ — 1⅛	1⅛ — 1⅛	12/6	..	..	6 10 11
814,016	Do. do. Defd.	1	Nil	Nil	Nil	..	3/16 — 5/16	3/16 — 5/16	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	..	1/4 — 1/4 xd	1/4 — 1/4	15/7½	..	..	5 14 8
595,600	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	92 — 95	92 — 95	95	93½	..	4 14 9
$10,823,200	Mexico Trams Co., Common Stock	..	..	..	..	..	130 —132	131½ —133½	132¾	132¼	+1½	..
$9,000,000	Do. 1st Mort. 50-year 5% Gld. Bds.	..	..	..	5 %	..	96 — 98	97⅜ — 99⅜	98¾	97	+1⅜	5 0 6
245,500	Potteries Electric Traction	1	4 %	4 %	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	..
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	..	1/16 — 1/8	1/16 — 1/8 xd	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	..	84 — 87	84 — 87	..	..	..	5 3 6
87,850	Telegraph Construction and Maintenance	12	15 %	17½%	15 %	17½%	35½ — 37	35⅞ — 37	36½	35	..	5 12 11
140,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
1,000,000	Underground Electric Railway, 5% Prior Lien	..	..	..	5 %	..	101 —102	101½ —103½	..	..	+ ½	4 17 7
2,800,000	Do. do. 4½% Bonds	..	..	..	4½%	..	88 — 90	89 — 91	..	..	+1	4 18 4
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	32 — 34	32 — 34	..	..	..	..
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	Nil	10 %	5 %	..	1/16 — 1/8	1/16 — 1/8	..	..	..	..
66,666	Do. 5 % C.P., 30,001 to 80,000 & 126,001 to 141,666	5	..	5	6 %	..	1½ — 2½	1½ — 2½	..	..	..	2 8 4
245,495	Do. % 1st Mort. Deb. Stock		4 %	4 %	4 %	..	68 — 73	68 — 73	..	..	..	5 9 7

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000	5	5½%	5½%	5½%	..	4⅜ — 4⅝	4⅜ — 4⅝	..	..	..	15 9
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	..	91 — 94	91 — 94	..	..	..	4 18 9
30,449	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 30,000	5	10%	10 %	10 %	..	7⅜ — 7⅝	7⅜ — 8⅛	8⅛	7⅛	+ ⅛	6 1 3
2,551	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	..	7⅜ — 7⅝	7⅜ — 7⅝	..	..	..	4 4 10
400,000	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	99 — 102	99 —102	..	..	..	3 18 5
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	..	3⅛ — 4⅛	3⅛ — 4⅛	83/9	82/6	..	5 14 3
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4 — 4½	4 — 4½	..	..	..	5 0 0
80,000	Do. "City Undertaking" 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4⅛ — 4⅜	3⅞ — 4⅛	..	..	..	5 2 10
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	95⅜ — 97⅛	95⅜ — 97⅛	97½	96⅛	..	4 2 1
49,486	Chelsea Electricity Supply, Ord.	5	4½%	4½%	4½%	4½%	3½ — 3⅝	3½ — 3⅝	78/1½	..	..	6 0 0
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	98 —10	98 —101	..	..	..	4 9 1
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	11⅛ — 14	11⅞ — 12½	12⅝	11⅞	..	5 0 0
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12½ — 13½	12½ — 13½	..	..	..	4 10 7
400,000	Do. 5 % Db. Stk.	Stock	5 %	5 %	5 %	5 %	121 —125	121 —125	..	..	..	4 0 0
300,000	Do. 4½ % 2nd, Db. Stk.	100	4½%	4½%	4½%	4½%	99 —102	99 —102	100	..	..	4 8 3
80,000	County of Durham Electrical Power, Ord.	5	4 %	2 %	..	..	1⅝ — 2	1⅝ — 2	..	..	..	5 0 0
80,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	..	2⅜ — 2⅝	2⅜ — 2⅝	..	..	..	7 8 2
260,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	5 %	5 %	91 — 98	91 — 98	..	..	..	5 7 6
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	5 %	7⅛ — 8	7⅛ — 8	7⅛	..	..	6 5 0
55,060	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	..	10⅜ — 11½	10⅜ — 11½	10⅝	..	..	5 6 8
400,000	Do. do. 4½ % Deb. Stock	Stock	4½%	4½%	4½%	4½%	103 —106	103 —106	..	..	..	4 4 11
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	..	99 —102	99 —102	..	..	..	4 8 3
80,000	Edmundson's Electric Corporation, Ord. Shares	5	Nil	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	3 %	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	+ ⅛	Nil
480,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	..	68 — 71	69 — 72	72	70½	+1	6 5 0
$8,160,000	Electrical Dev.Co.of Ontario, 5% 1stMtg.Gold Bnds.	$500	..	..	5 %	5 %	81 — 84	81 — 84	83⅜	81½	..	5 19 1
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	..	4⅜ — 4⅞	4⅜ — 4⅞	..	..	..	5 12 10
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	..	4½ — 5⅛	4½ — 5⅛	..	..	..	4 13 6
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
15,000	Hove, 1 to 15,000	5	9 %	8½%	8½%	..	6⅞ — 7⅛	6⅞ — 7⅛	..	..	..	5 18 4
$1,376,000	Kaministiquia Power Co., 5 % Gold Bnds.	100	..	..	5 %	5 %	102⅛ —104⅜	102⅛ —104⅜	103⅜	..	..	4 15 8
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	10 %	8 %	..	7 — 7⅛	7⅛ — 7⅜	..	..	+ ⅛	5 3 3
80,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	94⅛ — 96⅛	94⅛ — 96⅛	..	..	..	4 2 11
111,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	2½%	3 %	..	1⅜ — 2⅛	1⅜ — 2⅛	..	..	..	4 4 8
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	..	5 — 5⅜	5 — 5⅜	5⅜	..	..	5 11 8
882,855	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4½%	4½%	4 %	4 %	91½ — 93½	91½ — 93½	..	..	..	4 5 7
200,000	Metropolitan Electric Supply, 1 to 100,000	5	8 %	6¾%	5 %	..	4⅜ — 4⅝	4⅜ — 4⅝	85/-	..	+ ⅛	5 5 3
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	..	4⅝ — 5	4⅝ — 5	..	..	..	4 10 0
285,000	Do. 4½ % 1st Mort. Deben. Stock	Stock	4½%	4½%	4½%	4½%	104 —107	104 —107	..	..	..	4 4 1
248,000	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	83 — 86	83 — 86	..	..	..	4 1 5
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	100	5 %	5 %	5 %	..	81 — 83	83 — 85	84½	83⅜	+2	5 17 8
18,585,000	Do. Light and Power Co., Ltd., Common	$100	..	..	3½%	..	74 — 76	74½ — 76½	76½	74	+ ½	4 11 6
$2,400,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	7 %	..	101 —105	103½ —105½	105	103	+1½	6 12 8
12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	100	..	..	5 %	5 %	90 — 91	90 — 91	91	90½	..	5 9 11
950,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	96 — 98	96 — 98	..	..	..	4 11 10
180,491	Newcastle-on-Tyne, 1 to 187,500	5	8 %	8 %	2½%	..	3⅞ — 4⅛	4 — 4⅛	..	..	+ ⅛	2 11 1
187,500	Do. 5 % Pref., 1 to 187,500	5	5 %	5 %	5 %	..	4⅛ — 5	4⅛ — 5	..	..	..	5 11 1
196,500	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,965	100	..	..	..	5 %	99 —101	99 — 101	100½	100	..	4 19 9
10,852	Notting Hill Electric Lighting	10	7½%	7½%	7 %	..	12½ — 13½	12½ — 13½	..	..	..	5 6 0
20,000	Oxford, 1 to 96 and 407 to 20,510	5	7 %	7 %	..	7 %	6⅝ — 6⅞	6⅝ — 6⅞	..	..	+ ⅛	3 16 9
80,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	98 — 96	93 — 96	..	..	..	4 1 8
119,894	River Plate Electy. Co. Ord. Nos. 1 to 120,507	1	2½%	6 %	8 %	..	1⅜ — 1 11/16	1 11/16 — 1 13/16	36/-	32/9	+ ⅛	5 19 0
100,000	Do. do. 6% Non Cum. Pref. Nos. 1 to 100,000	1	6 %	6 %	6 %	..	1 29/32 — 1	1 31/32 — 1	..	..	..	4 15 8
200,000	Do. do. 5% Deb. Stk. Red.	100	5 %	5 %	5 %	5 %	101 —104	102½ —104½	..	..	+ 1½	5 9 7
40,000	St. James' and Pall Mall Electric Light, Ord.	5	10 %	10 %	10 %	10 %	8½ — 9	8⅝ — 9⅛	8⅝	8⅝	+ ⅛	4 14 11
80,000	Do. do. 7 % Pref. 20,081 to 40,080	5	7 %	7 %	7 %	7 %	7 — 7⅛	6⅞ — 7⅛	7⅛	7	— ⅛	4 0 6
150,000	Do. do. 5½ % Deb. Stock Red.	100	5½%	5½%	5½%	5½%	88 — 87	88 — 87	..	..	..	Nil
12,000	Smithfield Markets Electric Supply, Ord.	5	Nil	Nil	Nil	..	2 — 2⅛	1⅝ — 2⅛	36/3	..	— ⅛	9 6 1
85,000	South London Electric Supply, Ord.	4	5 %	4 %	5 %	5 %	2⅜ — 2⅝	2⅜ — 2⅝	..	..	..	..
120,100	Do. do. 5 % 1st Mort. Deb.	100	..	..	5 %	5 %	100 —103	100 —103	60/-	57/6	..	4 8 11
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	..	1 3/16 — 1 5/16	1 3/16 — 1 5/16	..	..	..	5 15 6
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	..	1⅜ — 1⅝	1⅜ — 1⅝	..	..	..	4 7 5
224,526	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	..	100 —103	100 —103	..	..	..	26 6 8
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	14 5 4
80,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	5 14 8
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	..	74½ — 78½	74½ — 78½	76	..	..	5 6 8
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 808,000	1	..	..	5 %	..	1⅝ — 1⅞	1⅝ — 1⅞	17/6	..	..	5 9 7
100,00	Westminster Electric Supply, Ord.	5	12 %	10 %	10 %	10 %	8⅝ — 9⅛	8⅝ — 9⅛	9	8⅛	..	4 8 9
51,279	Do. do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905	5	4½%	4½%	4½%	4½%	4⅛ — 5⅛	4⅛ — 5⅛	5⅛	..	..	

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange.

Bank rate of Discount 3% per cent., February 10th, 1910.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING JANUARY, 1910.

The January returns of electrical business show a considerable falling off from the high values recorded during the closing months of 1909, in all three sections.

For the month the exports totalled £257,424, a figure which is about level with the value recorded in January, 1909, but is, of course, far below the exceptionally high total of December last. Even considered apart from the telegraphic items, the exports are below the average of the year 1909.

The imports similarly show a fall in value from £199,631 in December, to £151,955 in the month under review—the latter value also being below the average of the preceding 12 months.

The re-exports amounted to £15,510, a figure which compares with £18,278 in the previous month.

With unimportant exceptions the totals of all the sub-sections of both exports and imports are lower than in the previous month.

Prominent purchasers during the month were, as usual, the South American states, Japan, India, Australia, China, &c.; while of the importers, who, it may be noted, continue to grow in number Germany takes the lead as in previous months.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Country receiving exports and importing.	Electrical goods and appliances.	Wires and cables, rubber and other insulations.	Electric lighting fittings and accessories.	Electric lamps and parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells.	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	151	1,222	18	113	420	2,436	118	...	...	583	306	5,367
Germany	98	233	79	245	28	693	...	...	...	...	31	1,607
Netherlands	250	1,043	49	...	186	430	...	...	...	...	28	1,986
Belgium	183	299	41	...	528	445	...	178	...	289	17	1,979
France and French Indo-China	354	...	460	503	54	1,583	150	...	...	5	33	3,142
Portugal	98	...	...	32	...	264	65	98	...	...	717	1,274
Spain and Canary Isles	116	...	582	...	...	2,448	...	128	...	31	253	3,558
Italy, Austria-Hungary and Switzerland ...	173	...	45	57	2,371	418	1,100	82	...	...	410	4,656
Greece, Roumania and Turkey	38	...	120	22	...	207	...	37	...	...	51	475
Channel Isles, Gibraltar, Malta and Cyprus...	12	...	103	91	...	283	68	4	...	...	295	856
U.S.A., Philippines and Cuba...	189	...	169	53	56	858	...	...	934	...	6,582	8,841
Canada and Newfoundland	300	1,239	241	1,722	1,260	690	18	12	14	...	103	5,599
British West Indies and British Guiana ...	20	...	5	41	...	240	21	12	...	68	...	407
Mexico, Colombia and San Salvador... ...	164	...	26	635	...	382	...	7	...	...	...	1,214
Uruguay	...	...	49	...	...	649	...	...	...	11	17	726
Chile	75	542	29	364	4	800	...	55	...	891	...	2,760
Brazil	244	899	151	229	149	3,006	43	1,579	...	137	4,841	11,278
Argentine	2,485	2,328	421	2,451	871	19,296	...	2,544	86	1,933	4,074	36,489
Egypt and Morocco	92	417	39	24	24	1,284	16	267	...	1,919	25	4,037
British West Africa, St. Helena and Liberia...	...	136	8	...	...	...	83	5	...	14	1,031	1,277
Cape of Good Hope	580	1,229	149	147	157	1,787	...	539	...	6	200	4,794
Natal	798	7,202	67	116	2	338	315	991	...	130	16	9,975
Rhodesia, O.R.C. and Transvaal	2,153	1,227	231	799	9	2,339	...	47	63	8	...	6,876
Zanzibar, Brit. E. Africa, Mauritius and Aden	188	48	132	173	...	...	...	37	...	174	16	768
Azores, Madeira, and Portuguese Africa ...	183	556	58	206	...	821	552	1	...	173	673	3,223
China and Siam	1,302	3,046	227	643	26	5,769	554	37	...	457	64	12,125
Japan and Korea	73	7,277	386	29	2,773	22,789	2,362	11	...	1,082	2,652	39,434
Java and Dutch Borneo and Indies	7	110	6	41	...	161	...	...	...	...	...	325
India	1,231	3,561	2,629	1,980	78	14,114	1,478	3,551	210	258	1,595	30,685
Ceylon	9	174	88	187	...	446	459	253	9	68	2,935	4,628
Straits Settlements and Fed. Malay States...	85	264	171	688	155	1,145	87	94	162	23	774	3,648
Hong Kong	306	36	231	205	21	340	57	21	63	23	43	1,346
West Australia	178	1,019	45	641	...	1,177	...	14	...	40	8	3,122
South Australia...	556	3,977	52	47	18	2,076	...	17	...	1,235	1,244	9,222
Victoria	1,389	3,358	24	202	139	2,723	...	563	13	335	994	9,740
New South Wales	1,603	1,666	66	1,028	828	1,866	...	189	...	10	658	7,914
Queensland	116	752	10	...	...	1,244	...	14	...	33	...	2,169
Tasmania	76	167	...	...	...	181	...	...	...	223	11	658
New Zealand	351	4,001	342	622	175	1,531	337	101	...	1,138	646	9,244
Total, £	16,155	48,028	7,549	14,330	10,332	97,459	7,883	11,488	1,554	11,297	31,343	257,424

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

Russia, Norway and Sweden	475	...	24	64	...	1,128	...	90	10	3,824	5,615
Germany	431	8,124	1,106	42,906	1,395	23,396	5	1,225	7,113	9,767	95,468
Denmark	...	...	...	...	...	359	...	202	...	...	561
Holland	12	40	...	2,140	10	2	...	...	115	2	2,321
Belgium	330	3,031	66	96	111	716	...	113	656	2,374	7,493
France	16	...	616	1,296	*344	699	...	1,400	2,751	4,505	10,939
Switzerland	35	121	17	419	63	225	4	...	147	43	1,074
Spain	...	...	...	...	...	...	...	5	150	...	155
Italy	49	3,419	...	...	...	...	...	...	...	2,806	6,274
Austria-Hungary	12	128	...	819	...	9	...	5	1,119	56	2,148
United States	1,819	1,077	893	2,432	100	7,969	5,309	71	18	219	19,907
Total, £	3,179	15,940	2,722	50,172	1,335	34,503	5,318	3,111	12,079	23,596	151,955

Additional imports: China, machinery, £2; Canada, arc lamps, £40. * Deduct to correct last return.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

	£	£	£	£	£	£	£	£	£	£	
Various countries, mainly as above	1,398	314	...	1,094	...	5,570	...	267	877	5,990	....

TOTAL EXPORTS: £257,424. TOTAL RE-EXPORTS: £15,510. TOTAL IMPORTS: £151,997.

NOTE.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns.

THE EDISON NICKEL-IRON CELL.

ALMOST nine years ago, the invention of a nickel-iron storage cell by Mr. Edison was announced, and a few years later the cell was placed upon the market with much *éclat;* in spite of widespread incredulity, it was proved that the cell could withstand rough usage such as would be fatal to a lead cell, and had certain marked advantages particularly for traction, while its construction was mechanically a model of ingenuity and skill. However, after a brief comet-like appearance, it disappeared, and was only heard of at intervals. But now it has come forward again, under the auspices of the Edison Storage Battery Co., of Orange, N.J., and a full description of the improved pattern was published in the *Electrical World* of the 20th ult., from which we obtain the following particulars. In the main the cell resembles its predecessor, but the structure of the positive plate has been radically modified. At present the battery is made in two sizes; one size having four positive and five negative plates, and the other possessing six positive and seven negative plates. The active material in the positive plate consists of nickel oxide, and iron oxide is used in the negative electrode. The electrolyte consists of potassium hydrate (21 per cent. solution) to which is added a small amount of lithium hydrate. The function of the lithium hydrate is not clearly defined, but it has been found to improve the working of the positive electrode. The normal specific gravity of the solution is 1·210, which does not change during charge or discharge. The efficiency and capacity of the cell, however, are not affected to any extent if the specific gravity of the solution is as low as 1·160. Below this a temporary effect is noticeable in the output of the cell.

The cover of the cell, which is also welded in place, has four mountings. Two of these are for stuffing-boxes through which the positive and negative poles extend; one is a separator which prevents the loss of electrolyte while allowing the gases to escape, and the other is an opening for water and electrolyte. This opening is fitted with a water-tight cap held in place by a catch; fastened to the cap is a spring so arranged that the cap will fly open unless properly fastened. In an assembled battery each individual cell is held securely in place and from contact with adjacent cells by means of small ebonite buttons fitting into indentations in the sides and bottom of the cell.

The separator through which the gases escape while the battery is being charged is designed in such a way that these escape in a practically dry condition. The electrolyte, therefore, need only be replenished with distilled water, until completely changed every eight or ten months.

The electrical connections between the cells are made by heavy copper connectors, well plated with nickel. The lugs at the end fit over taper-joint binding posts, and are held in place with a nut. Some data of the cells are given herewith:—

	Type A 4.	*Type A* 6.
Rated ampere-hour output	150	225
Average discharge voltage per cell	1·2	1·2
Normal rate of charge and discharge in amperes	30	45
Weight (in pounds) of cell complete	13·5	19·2
Width of cell (inches)	$2\frac{9}{16}$	$3\frac{3}{4}$
Breadth of cell	5	5
Height of cell	$13\frac{3}{8}$	$12\frac{3}{8}$
Height of battery compartment	15	15

FIG. 1.—PLATES ASSEMBLED.

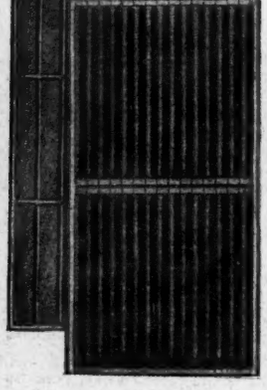


FIG. 2.—POSITIVE AND NEGATIVE PLATES.

FIG. 3.—COMPLETE CELL.

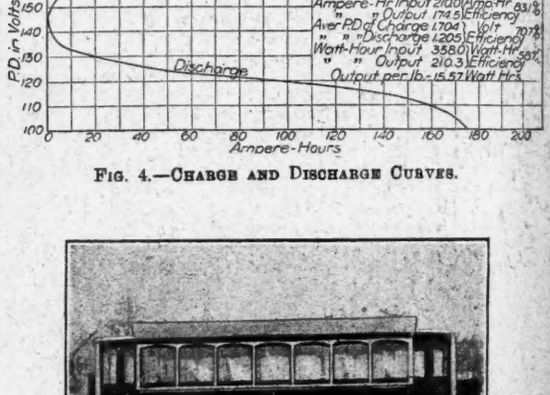

Charge
Discharge
P.D. in Volts
Ampere-Hours
A4 Type Cell Weight 13.5 lb
Charged 7 Hrs. at 30 Amp
Discharged at 30 Amp
Ampere-Hr Input 210.0 Amp-Hr 83%
" Output 174.5 Efficiency
Aver. P.D. of Charge 1.704 Volts 107%
" " " Discharge 1.205 Efficiency
Watt-Hour Input 358.0 Watt-Hr 58%
" " Output 210.3 Efficiency
Output per lb - 15.57 Watt Hrs.

FIG. 4.—CHARGE AND DISCHARGE CURVES.

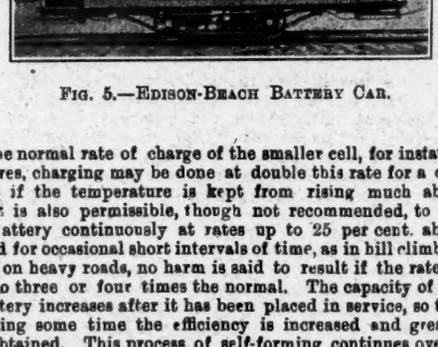


FIG. 5.—EDISON-BEACH BATTERY CAR.

The cells are made of electroplated steel welded at the seams by the autogenous method—that is, by the application of the oxy-acetylene blow-pipe. The walls of the cell are corrugated so as to obtain the greatest amount of strength with minimum weight. The iron element has an excess capacity over the nickel element, and does not differ from the iron electrode formerly used, except that the process of making the active material and the method of loading it into the containers have been improved. Much time has been spent in perfecting the nickel element. The former positive plate was made up of flat rectangular pockets containing nickel oxide and graphite; it was found that the graphite oxidised, and that mechanically the structure could not resist the swelling of the nickel oxide. In the new plate round tubes 4 in. long and about the diameter of an ordinary pencil are used to retain the nickel oxide; the tube is made of thin perforated steel, which, when filled with the active material and bound with eight steel rings, prevents expansion of the active material, and ensures perfect internal contact.

Instead of the graphite formerly employed, electrochemically prepared flakes of pure nickel are interspersed in the oxide to increase the conductivity of the active mass, because nickel oxide of itself is a poor conductor. Each positive plate consists of a grid of nickel-plated steel holding 30 of these tubes. The negative plate comprises 24 flat rectangular pockets supported in three horizontal rows in a nickel-plated grid. The pockets are made of thin nickel-plated steel perforated with fine holes, each pocket being filled with oxide of iron, and afterwards subjected to very heavy pressure.

The plates of each group are hung on a connecting rod perpendicular to, but integral with, the pole. They are held apart by nickel-plated steel washers and held firmly in contact by nuts screwed on both ends. The two outside plates are negative and are insulated from the container by sheets of ebonite. Ebonite pieces are also fixed between the cell and the side and bottom edges of the plates, and these, together with the ebonite rods inserted between the plates, maintain correct spacing and ensure permanent insulation.

While the normal rate of charge of the smaller cell, for instance, is 30 amperes, charging may be done at double this rate for a one-hour boost if the temperature is kept from rising much above 100° F. It is also permissible, though not recommended, to discharge a battery continuously at rates up to 25 per cent. above normal, and for occasional short intervals of time, as in hill climbing or starting on heavy roads, no harm is said to result if the rate be increased to three or four times the normal. The capacity of the Edison battery increases after it has been placed in service, so that after working some time the efficiency is increased and greater output is obtained. This process of self-forming continues over a period of one to three months of regular service, and it is partly to assist in this forming-up that over-charges are recommended at intervals. The highest practical limit of output is reached when a battery is charged 10 hours at the normal rate, and its value will be, for a fully formed battery, perhaps 30 per cent. more than the rated output. Efficiency is sacrificed somewhat, of course, when the highest available capacity of the battery is utilised. A seven-hour charge at normal rate is considered a normal charge.

It has been found in testing the battery under severe conditions that with a discharge three times the normal the voltage drops 0·03 volt for every 10 amperes increase. On returning to normal discharge the voltage comes up to a value a trifle higher than normal owing to the heat generated at the heavy discharge rate. Heating on discharge increases the output, while heating on charge diminishes it; but excessive heating at all times impairs the life of the battery and should be avoided. The watt-hour efficiency of the cell ranges from 60 to 65 per cent. The smaller size gives about 14 watt-hours per pound of cell, and the larger cell 16 watt-hours. The manufacturer lays stress on the claims that the battery cannot be injured by overcharging; it does not deteriorate when left discharged; any cell can be removed on simply detaching

the connections from the poles, and the battery has nearly twice the output or mileage of other batteries weight for weight. The purity of the chemicals used and the structure of the cell ensure great durability and long life.

On January 20th a tramcar equipped with Edison batteries was tested at West Orange, N.J., with gratifying results.

The car was of a special type designed for the purpose by Mr. R. H. Beach, with a car body, truck and driving equipment very much lighter in weight than ordinarily used. The body of the car is 18 ft. long between posts, with 4-ft. vestibule platforms; the width is 7 ft. 3 in. The seating capacity of the car is 26

Under each seat, running the entire length of the body of the car, is a lattice steel electrically-welded girder, which also forms a box for the batteries, a seat rest, a support for the side posts and a remarkably firm foundation for the entire structure. This girder is the novel feature of the car body; when the latter is loaded in the centre with 2 tons, and supported at each end only, the deflection is hardly noticeable. The ordinary end doors are omitted, but the vestibules are entirely enclosed.

The battery consists of 200 cells of the Edison A 4 type for driving, and 10 cells of the same type for lighting. These are connected in series when being charged, but are separately connected when working, so that any variations in voltage owing to the operation of the car will not affect the lamps. The truck is of the standard gauge, four-wheel type, with 6 ft. 6 in. wheel base. The frame of the truck is of steel, welded at all joints. Light steel wheels are mounted on 2½-in. diameter steel axles, each of which is divided in the centre and provided with a steel sleeve to permit the free rotation of each wheel independently of its mate. Telescoping steel spring seats are provided between the truck and the body, which permit a side or end movement of not more than ¼ in. The vertical movement is, of course, free. By this means the manufacturer expects to obtain a very smooth-riding body.

The driving equipment consists of two 5-H.P. 110-volt Northern motors, which, besides possessing fairly high speed, are much lighter in construction than standard motors of the same output. The wheels are driven from these motors by a silent chain drive. During the trials it was found that the motors gave the car a maximum speed of 15 miles per hour, and with 14 stops per mile enabled a schedule of 8 miles per hour to be maintained. The power consumption in accelerating is said to be about 3½ KW., and in running about 1½ KW.

The controllers are arranged to give the following three combinations: First step, batteries in parallel at 50 volts and motors in series; second step, batteries in parallel at 100 volts and motors in series; third step, batteries at 100 volts and motors in parallel. During the tests the car accelerated quite smoothly. The body of the car weighs 3,500 lb., the truck and electric equipment 3,500 lb., and the battery 3,000 lb., giving a complete car of 10,000 lb. In the design of the car many new features other than those mentioned are embodied. The battery is said to be capable of supplying energy for 150 miles on a single charge.

THE GENERAL ELECTRIC CO.'S ANNUAL DINNER.

On Saturday last the 20th annual dinner of the General Electric Co., Ltd., was held at the Trocadero. Mr. H. Hirst, vice-chairman and managing director of the company, presided, in the absence of the chairman, Mr. G. Byng, who had taken refuge from the asperities of the English winter in a milder climate, and there were present nearly 500 guests and members of the staff, the former including many leading representatives of engineering and the other learned professions.

After the loyal toasts had been duly honoured, Mr. Hirst, proposing "British Industry," regretted the absence of the chairman of the company, Mr. G. Byng, who was seeking health in a warmer climate. He said he was going to blow the trumpet of the manufacturer, for the utilitarian should not be quite neglected. The Press was apt to hold up the manufacturer as a grinder of the faces of the poor. The Institution of Electrical Engineers pursued its lofty course in the interests of applied science. The politician merely regarded him as the subject of taxation, and could not distinguish between trade and industry; but trade created unskilled labour; industry, skilled labour. The working man was told that the manufacturer lived at ease on the products of his labour, and he knew nothing of the narrow margin between success and failure. The total income of the directors and shareholders of a company such as the General Electric Co. was only 10 per cent. of the expenditure on wages, &c. Between the politician and the workman, the poor manufacturer was crushed; he begged all his audience to do what they could on behalf of the manufacturer. The chief qualification of the President of the Board of Trade was to know nothing about manufacture. Only 18 months ago the B of T. had initiated a census of production in order to find out something about the subject. It had started Labour Exchanges, but absolutely without inviting the co-operation of a single one of the manufacturers! As regarded unemployment, when Mr. Conner, their Manchester representative, advertised for two improvers, he had to get the police to clear the streets! Before the Board of Trade could find work for the men, it must find orders for the employers. In America, France and Germany, manufacturers were esteemed and honoured, and if the authorities were to cultivate the welfare of industry in this country, no one would more readily afford support than the King himself. Modern manufacturing originated last century with the introduction of steam, and for a time we were supreme; but during the last three decades our supremacy had been challenged. America and Germany started where we left off, and by wise administration of capital, together with the protection afforded by their Governments, had brought their industries to the highest state of efficiency. German industries were organised like a military body, to act together for the benefit of the nation; how could individual British firms hope to win in such a one-sided conflict? They must organise—but they could not organise while the Government did nothing for industry. Unless they soon did something to remedy this stupid, criminal position, good-bye to British industrial supremacy—and therefore to the British Empire. Sir J. Tavernor belonged to a country which did do something for industry—Australia. The Hon. Sir J. Tavernor, in reply, quoted a letter to the *Times* by Sir E G. Burls, urging the necessity of developing production and the resources of the Empire. In Australia they had adopted the policy of encouraging industry and employing their own people. Other countries than Britain were edging their way into the Colonial trade, but the Colonies preferred to trade with the mother country. In 15 years the trade with the Colonies had doubled, but the British share of it was not increasing as rapidly as that of foreign countries. That was not right, and he appealed to British manufacturers to develop their trade with the Colonies. He complimented Mr. Ben Morgan on his excellent work on the trade of Australia. It was time the British people woke up and helped their brothers in Australia to trade with them; they wanted reciprocity with this country, though they would remain loyal even if they did not get it. Mr. Faithful Begg also replied, regretting the absence of his old friend, Mr. Byng. Capital, he said, was the life-blood of commerce, and without it labour could do nothing. The capitalist was a shy bird, and must have the assurance that his manufactures would be carried on in bulk, and his tenure would be safe. The whole of modern legislation was dedicated to the consumer, without regard to the interests of the producer, and the home market was thus spoilt. There was no doubt whatever that capital was now neglecting home industry and seeking outlets abroad, as it never had done before. That was a very serious fact. The Chairman had skated all round a certain subject, but had not mentioned a certain phrase. That was the only cure for the present situation—Tariff Reform. Nothing whatever—not even the excellent book of Mr. Byng—had done so much for Tariff Reform as the recent General Election. When the next election came—it would not be very long—if they could get a straight issue upon it, Tariff Reform would come in triumphant.

Mr. M. J. Railing proposed "Electrical Engineering"; he said the keynote of Mr. Hirst's speech was co-operation and combination in British industry; he wished to apply those principles to electrical engineering, for which modern conditions required the best possible scientific training. He advocated the co-operation of manufacturers with the excellent technical institutions of this country in improving the training of their employés. Mr. W. Duddell, replying, said that progress in electrical engineering must continue to be made. The use of electricity in mines was making great progress; also in textile and rolling mills electrical driving was advancing Machine tools, lighting, main railway electrification were other great openings for electrical work. He drew a parallel between electrical happenings when Halley's comet last visited us and the present visitation. Then, telegraphy was being developed; now, the electrical industry would experience a great development. Mr. R. K. Morcom, chairman of the Birmingham Section of the I.E.E., also replied. The President of the Institution had said that electrical engineering was the mascot of engineering; she was, in Mr. Morcom's opinion, starved and ill-treated.

Mr. E. G. Byng proposed the "Engineering Press" in a maiden speech, remarking on the great power of the Press, which taught, advertised and amused them all. But it ought to back up the English engineering industry; some papers did; he hoped the others would turn over a new leaf and do likewise. Prof. C. A. Smith replied in a humorous speech, describing some of his experiences in journalism.

Mr. A. Colefax, M.P., proposed "The General Electric Co., Ltd."—the "Whiteley" of the electrical engineering world, but, unlike that concern, the manufacturer of its own wares and a great employer of labour. It was the only firm making carbons in this country, and a pioneer in the manufacture of metallic-filament lamps in England. He hoped that the Government would place its future telephone orders in this country, for which work the General Electric Co. had equipped itself. He concluded by eulogising the qualities of the Chairman, who, in reply, accepted the complimentary remarks on behalf of the capable and loyal staff and of the absent chairman, Mr. G. Byng, to whom a telegram was sent, expressing the cordial good wishes of the meeting.

Afterwards an entertainment was given by Miss Margaret Cooper, Miss Helen Mar, and Mr. Barclay Gammon. A programme of music was performed during the dinner by the London Orchestral Band. The proceedings were, as usual, successful in every way.

Worcester.—A Local Government Board inquiry was held on February 17th into the application of the Town Council for a loan of £656 for coal-handling plant at the electricity works. There was no opposition.

PROCEEDINGS OF INSTITUTIONS.

Balancers for Three-Wire Systems.

By A. G. COOPER, A.M.I.E.E.

(*Abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS *at Manchester, February 8th, 1910.*)

THE author first describes several forms of continuous-current balancers, consisting of two shunt machines mechanically coupled together.

In fig. 1 a balancer is shown, having a double-wound armature with a commutator at each end: the armature is specially wound, one set of windings being shorter than the other, as shown in fig. 2. As the end-windings of the left-hand side are placed between the main and auxiliary magnets, the conductors from that end do not come under the influence of the auxiliary magnet. The main

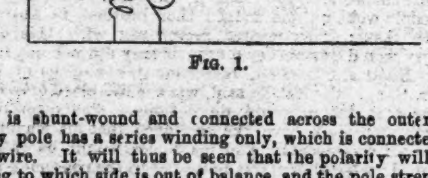


FIG. 1.

magnet is shunt-wound and connected across the outers. The auxiliary pole has a series winding only, which is connected in the middle wire. It will thus be seen that the polarity will change according to which side is out of balance, and the pole strength will vary according to the extent of the out-of-balance current. The short lengths of the windings of the right-hand side will have voltage induced in them either in conjunction or in opposition to the remainder of the windings rotating in the main field. This type of machine has been in use for a number of years at Blackburn, and has given every satisfaction. It will maintain the voltage equal within 1 per cent. over the whole of its range. It can be wound, the author believes, to give a perfect balance or even to boost the out-of-balance side unless troubles are experienced with the magnetisation due to the weak currents when there is a small out-of-balance, or to the residual magnetism when the balance is perfect. This could be got over by having a shunt winding and so working on a flatter point of the magnetisation curve, and letting the series winding help or oppose it according to its direction.

The latest form of continuous-current balancer is known as the C.M.B. This machine has only one armature, one commutator, and

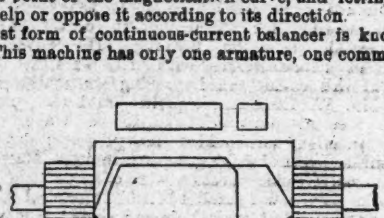


FIG. 2.

one set of brush-gear. The efficiencies of these machines are 4 or 5 per cent. higher than can be obtained with two machines coupled together, and the price at the same time is lower.

The static balancer or equaliser in this country has mostly been used in connection with rotary and motor converter installations, as it lends itself very readily to this class of work by making use of the secondary coils of the transformer, connecting the middle wire of the system to the star-point of the secondary coils of the transformers which are supplying the rotaries. In an article by Dr. Garrard* it is shown that this is bad from an efficiency point of view, and also that it is better to use a separate static balancer than the secondary coils.

The static balancer consists of a choking coil or a transformer core, with only one winding on each limb. Slip-rings are connected to equally spaced connections round the armature of the dynamo to give the number of phases proposed to be used. From the slip-rings an alternating E.M.F. is obtained which is connected to the terminals of the choking coil, shown in fig 3 as a four-pole for clearness, which in this case is a three-phase balancer; the star-point is connected to the middle wire. When the system is balanced, there is a strong choking action which prevents any large flow of alternating current from the slip-rings. When an out-of-balance current flows through the balancer and the armature, there will be a drop in volts due to the resistance, but this will be shown later to be practically no greater than in most balancers, if the static balancer is suitably designed.

The advantage of a static balancer compared with an ordinary balancer is that, in the former case, there are only brushes running on slip-rings, as compared with brushes on commutators, armatures, field coils, bearings and starter, and also greater space required. They are high in efficiency and automatic in action.

Some makers prefer single-phase, others two and three-phase, but Dr. Garrard has shown† that the greater the number of phases used, the better for regulation. For single-phase he gives a difference of voltage worked out on an assumed internal drop in the armature on a 10 per cent. out-of-balance as 0·66 per cent., three-phase 0·58 per cent., and six-phase 0·49 per cent., but I hardly think, from a commercial point of view, that it would be advisable to have more than three phases, unless the slip rings are brought outside the

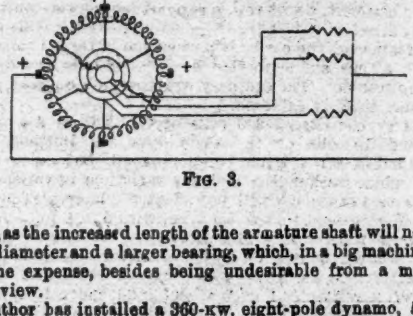


FIG. 3.

bearings, as the increased length of the armature shaft will necessitate a larger diameter and a larger bearing, which, in a big machine, would run up the expense, besides being undesirable from a mechanical point of view.

The author has installed a 360-KW. eight-pole dynamo, 520 volts, 700 amperes, 350 R.P.M., fitted with slip-rings which are large enough to use the machine at full load as a three-phase alternator if required. The static balancer is designed to deal with an out-of-balance load of 170 amperes. The machine has a compound winding for traction purposes only, so it is run as a shunt machine when using the static balancer; in the event of using a static balancer with a compound-wound machine, or one with commutating poles, the series winding must be split, half being connected in the negative and half in the positive side of a generator, otherwise the static balancer will not give the true middle—*i.e.*, the volts will not be equal between the middle wire and each of the outers, due to the lost volts in the series winding.

To take an example, assuming that at full load the resistance of the series turns causes a loss of 1 per cent. of the armature volts in a 500-volt machine, the neutral and one of the outers would be 5 volts higher than the neutral and the other side in which the series turns were connected. The following tests were taken on the static balancer:—

Out-of-balance. Amperes.	+ Volts.	— Volts.	Difference. Volts.	Per cent.	Per cent. full load of balancer.	Per cent. full load of dynamo.
10	257·0	258·0	1·0	0·2	6	—
43	257·0	258·5	1·5	0·3	25	6·1
60	257·0	259·0	2·0	0·4	35	8·5
80	256·5	259·0	2·5	0·5	47	11·4

From the foregoing tests, it is reasonable to assume that the difference in the voltage across the middle and the outers would not exceed 1 per cent. at the full load of the balancer. The balancer in the case mentioned has one-quarter of the capacity of the generator. If very heavy out-of-balance currents have to be dealt with, in proportion to the size of the static balancer and generator, then a middle wire booster can be attached to the machine to boost the out-of-balance side (see fig. 4, which illustrates a rotary converter installation on

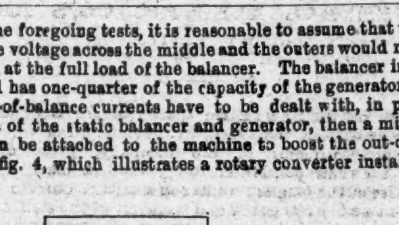


FIG. 4.

the low-tension side). To vary the voltage, if required, a diverter resistance is fitted across the field, which is series wound and connected in the middle wire.

DISCUSSION.

MR. J. S. PECK said he had not read the article by Dr. Garrard, but it was stated that the use of secondary coils was shown to be bad from an efficiency point of view, and that it was better to use a separate static balancer. He did not see why this should be, unless a three-phase connection was used, and a three-phase connection either for a static balancer or rotary transformer was not suitable. The theory of the static balancer was that current sent in at the centre point of the windings would flow in such a direction as to produce no resultant magnetisation of the core. In most three-wire machines the frequency was very low, and on that

* "Static Balancers," ELECTRICAL REVIEW, June 14th and 28th, 1907.

† *Ibid.*

account it was very difficult to make balance coils which did not take an excessive amount of current; also the low frequency (about 12) caused bad flickering of incandescent lamps. A balance coil placed on the slip-rings of a D.C. machine and taking a large current would cause the D.C. voltage to vary according to the frequency of the machine; it was necessary, therefore, to keep the magnetising current of the balance coils low. The tendency to fluctuation was much reduced with two-phase machines. Another reason for dividing the series winding was that if a series winding was put on one machine only and one side loaded, compounding would be obtained, whereas with the other side loaded no compounding would be obtained. With commutating-pole machines double winding of the commutating poles would give much better results than with only one winding per pole. Referring to the table at the end of the paper, he thought the difference in volts at full load would be much under the 1 per cent. quoted by the author.

Mr. H. Gray said he noticed that in nearly all the illustrations of the ordinary type of balancer the fields were crossed. This, of course, tended to automatically equalise the pressure on the two sides of the middle wire, and with close supervision there was no objection to the scheme; if, however, a machine of this type was situated in an isolated position, a heavy overload or short-circuit on the distributors would tend to make the motor run away owing to excessive weakening of the field, or flash over due to excessive overload. The risk would be much intensified if crossed series windings were used. Regarding the table, it was stated that the machine was designed for a maximum out-of-balance current of 170 amperes, and apparently there was no load on the outers, or a constant load was kept throughout the tests. Both the amount of out-of-balance current going from the static balancer, and the general output of the generator, would make a difference to the equality of the middle wire. At Accrington they had a 200-kw. motor-dynamo, the motor side generally running off traction generators, and the generator supplying general supply. A static balancer was arranged to work off the latter side. The load on the outers was varied from a quarter to full load, and the out-of-balance current taken from the static balancer from zero to 100 amperes. With three-quarter full load (300 amperes) on the outers and 100 amperes taken from the static balancer (which totalled to about full load on the plant), the percentage variation on either side of the middle wire from the normal was 2·4 per cent. This was probably quite good enough for commercial working in the majority of cases. Static balancing machines were much more useful than the ordinary balancer, and in the case of a short circuit affecting the middle wire they would stand up much better than rotary machines built for the same work. If a feeder intervened between a distributor and a static balancer, it might be necessary during the hours of darkness to employ a middle-wire booster, but during daylight working no middle wire booster would be necessary.

Mr. S. H. Worrall said that in the La Cour motor-converter the middle wire was connected to the neutral point of the rotor of the induction-motor. This arrangement appeared to possess the disadvantage of the transformer, and, at the same time, the advantage of the static balancer. The full advantage of the static balancer could be obtained, because the connecting wires from the rotor to the armature could be any number as desired, as there were no slip-ring connections.

Mr. C. C. Aitchison said his own experience of double-wound armatures was a most unhappy one, and in all cases single-wound armatures had to be substituted. Cross-connected shunt balancers took care of themselves very well, but when series windings were introduced, although the regulation was decidedly better, they were much affected by short circuits between the middle wire and either outer. Automatic regulators were altogether too costly.

Mr. C. F. Smith said that static and rotary balancers performed different functions. With cross-connected windings the rotary machines acted as compensators, whereas the static balancer simply provided a return path for the current, and if required to compensate demanded the addition of a booster.

Mr. S. J. Watson (chairman) thought the best form of balancer for a power station was a battery divided into two parts across the three-wire system and left continuously on the mains. If adjustments were made so that a slight discharge was always given, the battery would look very well after the small out-of-balance which usually occurred. He got over the difficulty of balancing supplies to cinematograph shows by running a short middle wire direct from the generating station, so that the pressure variation was entirely restricted to the consumers producing it, effecting a most satisfactory cure. The actual cost of running this middle wire with four or five services was from £70 to £80. Under the Cinematograph Act, which had recently become law, 100 volts was the maximum permissible pressure to be taken into any cinematograph room; therefore, if the inspectors carried out their work, motor-generators would have to be installed in all cases where the supply exceeded 100 volts.* He had employed an arrangement in which the whole of the middle-wire balancing current from the network was carried round the poles of one machine in one direction, and round the poles of the other machine in the opposite direction, and this had worked very well. In the event of a bad short between the middle wire and an outer, the fuse would probably blow, but this did not matter very much if the battery remained across the bus-bars. It was very desirable to have a short-circuiting switch to cut off the windings from the balancers entirely. The question of static balancing had been mentioned by several writers of papers, but he thought it inadvisable to interfere with the construction of the usual direct-current machine.

* This view appears to be incorrect.—Eds. E.R.

Mr. A. G. Coopers, in reply, said the load on the machines during the test was about half-load, 300 or 400 amperes. He was prepared to vouch for the accuracy of his figures.

Physical Society of London.

At the annual general meeting on February 11th, the report of the Council was read, which showed that the number of Ordinary Fellows on the roll was 436, an increase of six on last year; 20 new Fellows had been elected. Two Honorary Fellows were elected at the last annual general meeting—namely, Mons. R. Benoit and Prof. Julius Thomsen.

The Treasurer's report showed that the year 1909 had been a record year for the receipt of subscriptions, the amount collected exceeding that realised in 1908 by over £150. The cost of printing had increased, so that the net balance had increased by only £22. Both reports were adopted, and the following were elected Honorary Fellows of the Society:—Prof. S. Arrhenius, Madame Curie and Prof. G. E. Hale.

The following Officers and Council were elected for the ensuing year:—

President.—Prof. H. L. Callendar.

Vice Presidents.—Those who have filled the office of President together with A. Campbell, Prof. C. H. Lees, Prof. A. Schuster and S. Skinner.

Secretaries.—W. R. Cooper and S. W. J. Smith.

Foreign Secretary.—Prof. S. P. Thompson.

Treasurer.—W. Duddell.

Librarian.—W. Watson.

Other Members of Council.—Prof. W. H. Bragg, W. H. Eccles, A. Griffiths, J. A. Harker, Prof. T. Mather, A. Russell, W. N. Shaw, F. E. Smith, R. S. Whipple and R. S. Willows.

Prof. H. L. Callendar then took the chair, and delivered an address on the application of resistance thermometers to the recording of clinical temperatures. The chief difficulty in connection with the use of resistance thermometers for this kind of work lies in the heating effect of the current. The problem to be solved in designing a suitable thermometer for clinical work is, with a given galvanometer and resistance-box, to find the resistance of the thermometer which will give the most accurate results for a given heating effect of the current. This is given by the equation $R = 2G + S$, where G is the resistance of the galvanometer and S that of one of the ratio arms. In the apparatus used at the meeting $G = S = 10$ ohms, giving $R = 30$ ohms, a resistance for the thermometer which gives the convenient scale of 0·1 ohm increase per degree C. It is important in the construction of a thermometer for clinical work to secure quickness of action and to reduce the heating effect of the current; a thermometer suitably designed will take up a steady temperature in about 10 seconds. The pattern of the thermometer must also be suited to the purpose for which it is intended. Three types were shown, and experiments were performed proving that these thermometers fulfilled the necessary conditions.

An Electrical Safety System for Use in Mines.

By H. J. Fisher, A.M.I.E.E.

(*Abstract of paper read before the* Institution of Electrical Engineers, *Newcastle, January 24th*, 1910.)

Although stringent rules have been issued by the Home Office to safeguard persons from shock through contact with metallic sheathings of cables, the framework of motors, and other appliances at times when faults exist on them, it is to be regretted that there have been many fatal accidents, severe shocks and burns, due to inefficient earthing or due to an earth wire being broken or detached by accident. The majority of accidents of this kind have occurred on portable machinery such as coal-cutters, conveyors, &c., these machines and the cables connected to them having to stand an exceptional amount of wear and tear and rough usage. In fact, it may be said that the conditions are more adverse to safety than on any other class of machinery.

At present the Home Office do not enforce the earthing of coal-cutters, portable motors, and trailing cables. In many cases, however, the framework is earthed through the metallic sheathing of the trailing cable, or, better still, a special core is sometimes inserted in the trailing cable as an earth wire. The earth conductor thus provided, however, is very liable to be damaged, and in many cases the connections have been made so crude and dependent upon the exercising of care on the part of the attendant, that the use of an earth wire is no guarantee of safety. This has unfortunately been proved by the occurrence of several accidents.

Such arrangements have proved to be entirely unsatisfactory, and have indicated the necessity for making the earth connections automatic and secure.

The author has devised and put into commission a system to reduce such risks. The object has been to provide a gate-end switch-box having automatic features which ensure cutting off the supply to the coal-cutter motor and trailing cable under any of the following fault conditions:—

1. Persistent overload (time-limit setting).
2. Short circuit between phases (time-limit setting).
3. A fault between any phase and earth (instantaneous release).
4. No-voltage, or failure of supply (instantaneous release).
5. A break or a bad contact in the earth circuit (instantaneous release).

The other considerations which have been studied in the design of the gate-end box are as follows:—

6. Suitable connections for incoming and trailing cables.

7. Joints to be made in a place where the use of a blow-lamp would not be permissible.

8. The assurance of sound earth connections between the armouring of the cable and the case.

9. Earth connections automatically made on plugs at both ends of the trailing cable.

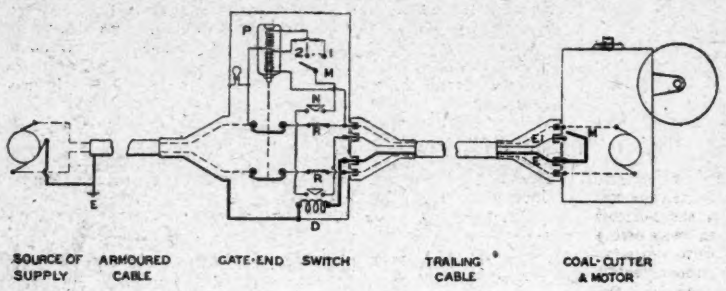


FIG. 1.

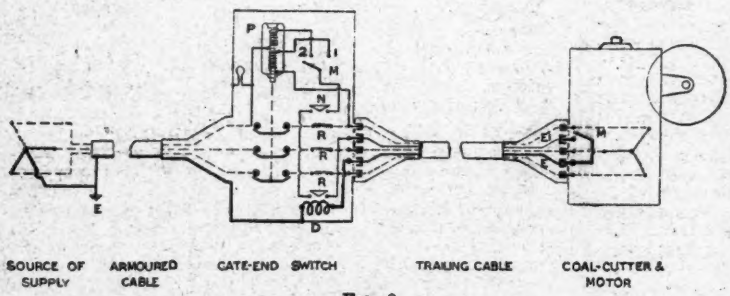


FIG. 2.

10. The system to be as simple as possible and negative in action, *i.e.*, if any part of the system is faulty it is to be impossible to make the coal-cutter motor alive.

11. No live parts to be accessible to the miner.

12. The case to be made so that there is no risk of an internal explosion permitting flame to be emitted therefrom.

13. The arrangement of the plug and sockets to be made so that it is impossible to draw out an arc in operating them. Provision to be made whereby a man at the coal-cutter frame can conveniently open the gate-end switch and is assured that the gate-end switch cannot be closed without his consent.

It is to be impossible to close the main switch if either of the plugs is out of position and lying on the ground, in order that it should be impossible to get a shock off the plug when in this position, the switch being made so that it is impossible to close the circuit or hold the switch in on a fault.

14. It is to be impossible to lock off the automatic gear to render it inoperative.

15. No fuses to be used. Numerous cases of shock and burns to workmen have been brought about by unskilled men replacing blown fuses by the dim light of a safety lamp. Moreover, a great deal of time is wasted in replacing fuses. The majority of men working on coal-cutting machinery are paid by the yard or ton of mineral cut, and rather than be delayed, they will overfuse the machine in order to get a heavier feed on the cutter, overloading the motor. Automatic switches of which the setting cannot be altered by unauthorised persons are preferable.

The system involves the use of a trailing cable having a pilot or subsidiary wire, in addition to an earth conductor (fig. 5). The gate-end switch is controlled by a solenoid in circuit with the pilot and earth conductor, so that, if the earth circuit is not complete, current cannot pass through the solenoid, and it is impossible to close the switch.

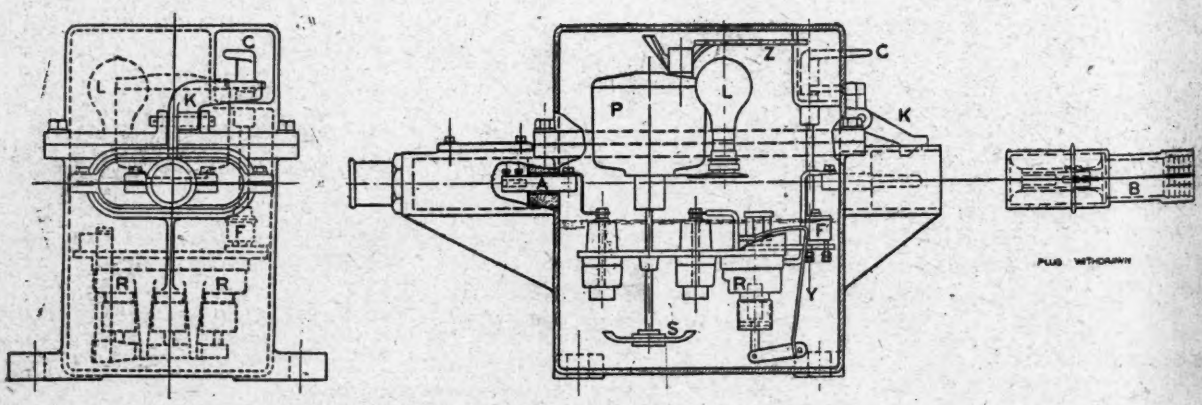
Fig. 2 shows the arrangement for a three-phase supply having an earthed neutral, and fig. 1 illustrates corresponding connections when used on a direct-current supply with an earthed neutral-point obtained by the addition of an extra brush on the commutator of the generator in the power station.

When the operating switch M is closed, and provided the pilot circuit E_1 and the earth conductor E are complete through the framework of the machine, then the solenoid P is energised and the main switch is closed. On releasing the handle of the control switch M, the switch springs automatically on to the contact No. 1, which puts a high resistance solenoid in circuit and also effects a change-over by which the connection through the solenoid is taken from the outgoing side of the switch. It will be seen that the main switch cannot be held in the closed position unless current passes through the solenoid, and there will be no circuit through the solenoid unless the earth circuit is complete through E and E_1, or if the supply voltage fails. By this means the switch opens automatically under the required fault conditions enumerated above.

Figs. 3 and 4 show the details of the gate-end box. S is a three-pole oil-break switch fitted with three overload release coils R, R, R, having a time-lagging device of the oil dash-pot type. A scale Y is provided for adjusting the setting of this overload arrangement. P is the controlling solenoid and has two windings, one of which is used to give a maximum pull at the moment of closing the switch, and the other is a coil of high resistance, consuming only the small amount of energy sufficient to hold up the armature when the switch is in the "on" position, but the switch is knocked out by means of simple mechanism, when the weight of the armature is released by the solenoid. F is a small control switch operated from the outside of the box at the handle G. This arrangement of control is on a free-handle principle—*i.e.*, in the event of a fault occurring the main switch is bound to trip out even though the control switch is held by the operator's hand, or an attempt is made to tamper with the device. With the method shown, it is impossible to lock the automatic gear out of action.

L is an indicating lamp which, by the aid of a simple shutter device, shows a light through a strong glass window and gives a clear indication so that it can be seen from the outside whether the switch is "on" or "off" The lamp is connected to the incoming cable, and so, when no light is shown, it indicates that the supply is cut off from this source.

The overload release coils R and R, in operating, open the control circuit and so release the main switch. The mechanism is enclosed in a strong iron case. The current-breaking parts are immersed in oil. The case and lid have wide machined joints to avoid the possibility of an emission of flame. Mechanical terminals are provided throughout, so that joints can be made without soldering. Those at A take the incoming cable, the insulated ends of which are situated in a box which can be run in solid with compound for the purpose of sealing the ends. Suitable glands are provided for earthing the armour thoroughly to the box. The trailing cable is attached to the plug B. The plug is enclosed in a strong cast-iron case, and it is so interlocked with the control switch that it is impossible to withdraw the plug when the main switch is closed. This interlocking is effected by a simple pawl at K, and it is obvious that it is impossible to draw out an arc in manipulating the plug, for the reason that the plug cannot be withdrawn when the circuit is alive. A corresponding plug is used at the coal-cutter end of the



FIGS. 3 AND 4.—DETAILS OF GATE-END BOX AND PLUG.

trailing cable, and a socket is made, as shown on fig. 6, suitable for fixing to any existing coal-cutter frame. Like the corresponding socket on the gate-end box, it carries a locking pawl K, interconnected with a small switch by which the men working the coal-cutter can open the control circuit, and so make the trailer and the motor dead, and ensure that they cannot be made alive until the switch is closed at the coal-cutter end. This is an important factor in the safe working of coal-cutters, and has not been provided for in any previous system. It is true that arrangements have been made which cut off the current to the motor at the coal-cutter end, but the author's system enables a supply to be cut off right back to

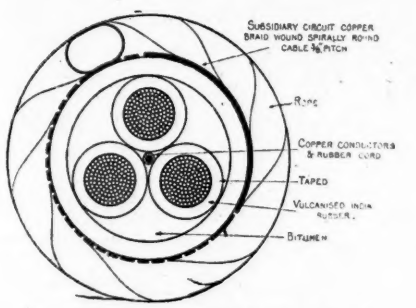


Fig. 5.—Trailing Cable (Actual Size).

the gate-end box, and not only disconnects the motor, but the trailing cable as well, and at the same time prevents any one accidentally closing this circuit if the men at the coal-cutter are carrying out any work on the machine.

The plug is made reversible so that the motor can be reversed, if necessary, by simply withdrawing the plug and reinserting it the other way round.

It is obvious that, if the plug is not in the socket, the control circuit is incomplete, and so it is impossible to close the main switch with the plug lying on the ground.

In the objects enumerated above, it has been mentioned that the switch was to open instantaneously in the event of a fault or leakage to earth occurring on the coal-cutter motor or on the trailing cable. This object has been attained in a very simple manner. Mr. McKie and Mr. Georgi have both proposed a system for branch feeders, in which a relay is inserted in the earth conductor. The relay operates when any current passes through the earth conductor, such as would be the case in the event of a leakage. This idea, as shown by letter D as applied to the gate-end box (figs. 1 and 2), represents the coil which is connected between the earth conductor in the trailer and the switch case. This electromagnet operates on a current well above that required through the solenoid of the main switch, in order to discriminate between the normal current in this earth circuit and the current which is there on

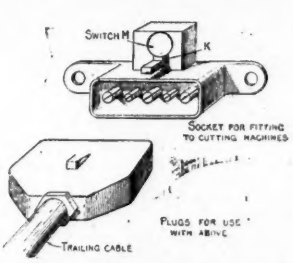


Fig. 6.—Plug and Socket for Coal Cutter.

account of a fault. It will be seen from the diagram that the electromagnet, in operating, opens the control circuit in a manner similar to the overload release. The distinction between the overload release and the leakage release is that the overload operates on a heavy persistent overload or fault between phases, whilst the leakage protection trips the switch instantly with a current which forms a small proportion of the normal full load.

It is suggested that the system described above may be of service on other electrical installations in factories, shipyards, ironworks, &c.

The system has had extended trial underground. Several times the earth wire was broken accidentally, and in every case the gate-end switch was opened and could not be closed again until a new trailing cable had been inserted.

Discussion.

Dr. Thornton (Armstrong College) complimented Mr. Fisher on the production of a really satisfactory gate-end box for use in mines, and said that if the system were used universally there would be no need for any of the various discussions now going on regarding the safe use of electricity in pits. The usual gate-end switch was anything but safe, and he noted with satisfaction that broad metal-to-metal flanges had been utilised in the design. In this connection he did not consider anything narrower than 2½ in. to be safe. The entire absence of fuses was another satisfactory feature, as these were quite out of place in a mine. Ordinary bonding was unsatisfactory as a safeguard, especially when there were a large number of boxes, as the bonds were liable to be forgotten and to deteriorate if provided. He approved of the design of the trailing cable, as provision had been made guarding against breakage of the pilot in the case of damage to the cable.

Mr. W. W. Wood (Messrs. Scott & Mountain) outlined two conditions under which the Fisher system would be no safeguard. In one case, in which two coal-cutters working near each other are considered, it would be possible for neither to give any indication of a fault, even if one of the pilots happened to break. In the other case, in which the coal cutter has a high contact resistance to earth, it might be possible to raise the frame to a potential approximately equal to the full voltage of the supply.

Mr. Guns suggested substituting the indicating lamps for the high resistance coil in the control circuit.

Mr. W. R. Morton (Messrs. Glover & Co.) thought that it would be agreed that the principle employed in the Fisher switch was the correct one, viz., not only to open under fault conditions, but to render it impossible to make circuit. The particular design of trailing cable was one of the essential features of the system, and it had been specially introduced by his own firm. One of the pilots was spiraled round the cores, and the other was placed between the cores, but it was of such a nature that it would expand or contract, thus meeting the mechanical strains arising under working conditions. The relay in the subsidiary circuit was a most valuable feature in that it took care of incipient faults. The value of such a device had already been tested, as a similar arrangement on a larger scale was used on the middle wire in most three-wire central stations.

Mr. H. W. Clothier (Messrs. A. Reyrolle & Co.) said that there was no doubt that protection was necessary in mines. He had spent many hours with Mr. Fisher over the design of the switch. Hitherto manufacturers had tried to palm off switchgear for special purposes, composed of a collection of standard parts, but the Fisher switch was an example of an entirely new design specially got out to meet certain well-defined, but difficult conditions, and he congratulated the author, not only on the success of the device, but on the production of a really practical paper on an important subject. He gave some figures relating to accidents in mines, which showed that there was need for safety devices such as would guard against gross carelessness.

Mr. F. O. Hunt said that the inclusion of dash pots using the oil in the switch tank did not look tempting, as there was bound to be trouble, sooner or later, due to the carbonisation of the oil. He also asked if the shrouding of the plug were sufficient to prevent any leakage to earth, when the pommel was lying on the ground.

Mr. Fisher briefly replied to the various questions raised during the discussion. The conditions suggested by Mr. Wood's first question had been tested, but it was found that they were never likely to occur under ordinary circumstances; and with regard to the second, although he had had nine breakages of the earth wire, he had never had any complaint of shock from the miners. Mr. Guns's suggestion was tried at first, but the arrangement was discarded as being unsatisfactory. No trouble had been experienced with the oil dash pots, as suggested by Mr. Hunt, and none was likely to occur where ordinary precautions were observed. In the case of his own plant, the oil was changed regularly once a week, the old oil being put through a filter, for further use. The shrouding on the plug was ample to protect the pins against all contact with the earth.

Equitable Charges for Tramway Supply.

The paper by Mr. H. E. Yerbury was discussed by the Glasgow Local Section of the Institution of Electrical Engineers on February 6th.

Prof. Bailey considered that Mr. Yerbury had made out a very good case. It seemed to him that in the bargain between the tramway company buying current and the supply company selling it, the latter came much better off. He wondered why the tramway companies put up with it. He considered Mr. Yerbury's paper very well timed.

Mr. Beveridge, speaking from the point of view of a small undertaking, said the average load during the week would be easily maintained by one engine and dynamo, but on Saturdays and Bank Holidays they required another engine or dynamo, and that plant had to remain with the stand by-plant, year in and year out for tramway purposes that had to be paid for. It did not seem fair to compare the tramway power load with the individual power consumer. From the municipal point of view, it would now be considered madness to put down two power stations.

Mr. W. W. Lackie said he was sorry a more definite conclusion had not been come to in the paper. He did not agree with Mr. Yerbury's allocation for the fixed charges and the allocation of the running costs. It appeared to him that the fixed charges should include practically everything except fuel, water, oil and waste. Interest, sinking fund and depreciation were undoubtedly fixed charges, but for a tramway supply the salaries, wages and repairs to plant appeared also to be a standing charge, irrespective of the number of units sent out. The only thing that varied per unit was the fuel, oil and water. The author agreed that the maximum demand was the fairest system of charging, and he (Mr. Lackie) was surprised that he did not apply this system straight away in order to get an equitable charge for a tramway supply. It was true that a tramway load was taken over a period of 16 to

20 hours, but it was found that the consumption was only equivalent to a maximum demand of some 8 hours per day, giving a load factor of some 33 per cent., and there were many commercial power consumers giving a very much better load than this. The great difference between a tramway supply and a supply to a commercial concern for power purposes was this—that separate plant had to be allotted to supplying the tramway demand, whereas the supply for an ordinary industrial power load could be used to supply lighting or power load indiscriminately. This meant that there was a diversity factor in the machinery required for the ordinary supply, and there was no such factor in a tramway load, due to the fact that the tramway supply used an "earthed" return. Tramway peak loads occurred on Christmas Eve, the very time when there was a peak load for lighting supply. The comparative capital cost between high and low-pressure systems could not be compared if they did not include the whole of the mains on both systems. It was incorrect to say that the running cost for a high-tension supply was more than that of a low-tension supply. Mr. Yerbury gave the whole case away when he said that no hard and fast rule could be laid down as so much depended upon local circumstances. There was no doubt about it, in Glasgow at least, that a combined station or stations would now be the most satisfactory thing, but at the time when the tramway department decided on electrification, their demand was much in excess of that of the electricity department, and they decided to put down a separate station. In the table giving the rates of charge for lighting and power in Glasgow it was stated that the works cost for a tramway supply was ·35d., and the total cost ·757d. He (Mr. Lackie) did not know where those figures were obtained, but he found on looking at the tramway accounts for the past year, that the works costs were ·35d., as stated by Mr. Yerbury, but that the total costs were 1·227d. This, however, was on the total high-tension units issued from the power house, the actual cost per D.C. unit at the low-tension bus-bars being 1·41d. The load factor in the electricity station was 18·23 per cent., not 16·83 per cent., and the load factor on the traction station was 39·8 per cent. on the number of units generated, but on the D.C. units it was only 33 per cent., the comparative costs of the two stations, Bradford and Sheffield (as given), were thoroughly unsatisfactory. Neither the maximum demand nor the load factor of the high-tension station were given. If in the Sheffield tramway department they got money at 3·13 per cent, they were very fortunate, but if their sinking fund was only 2 per cent., and depreciation and renewals only amounted to 1·8 per cent. (a total of 3·9 per cent.), he was pretty certain that the Bradford Corporation were allowing twice this. He considered that a fair charge was: interest, 3·5 per cent., sinking fund 3·3 per cent., reserve fund 1·2 per cent.—total, 8 per cent. In the low-tension tramway station quoted, the total allowed was only 6 per cent. Further, these standing charges should be quoted at a rate per KW. per annum, and not so much per unit.

MR. ROBERTSON (Greenock) argued that each case must be considered according to local circumstances. The maximum demand was the fairest system of charging. If the maximum traction load overlapped the lighting load the charges should be calculated on the maximum, and the maximum demand system applied in the ordinary case was not so suitable here. In small stations the tramway load curve showed very alarming peaks. For the tramways supply they had a combined load factor of 18 per cent., and power users whose load factor was 35 per cent. or more. There was no reason why these large power users should not be supplied at a less rate than the tramways. He had found storage batteries very useful in traction supply.

MR. NELSON contended that if the load curve was flattened by the tramways, the latter should benefit as well as the other departments. It was not fair that the benefits of the flattening should go to particular consumers.

MR. YERBURY afterwards replied.

Submarine Transmission of Energy.—It is announced that the hydro-electric station at the Trollhattan Falls has been completed, and is on the point of being set in operation. One half of the available power will be utilised by the power station, which will deal with 80,000 H.P. as a beginning. It is proposed to supply not only Gothenburg and various other towns in the south of Sweden, but also, as the scheme proceeds, Copenhagen and a large portion of the island of Zealand. A lecture on the latter scheme was recently delivered before the Electrotechnical Association of Copenhagen, by Torsten Holmgren, who is chief engineer in connection with the power section of the Swedish State at the Trollhattan Falls. Mr. Prior, the Copenhagen director of the northern cable factory, and Mr. Hentzen, managing director of the electric power station at Copenhagen, express the opinion that the use of the water power could be extended without difficulty in order to carry out the scheme. It would be possible, it is claimed, to transmit from 40,000 to 50,000 H.P. to Copenhagen, by means of an overhead line from Trollhattan to Helsingborg, and a similar transmission line from Helsingoer to Copenhagen, the two lines being connected by means of a submarine cable laid under the Oeresund. At present the requirements of Copenhagen are represented by 20,000 H.P., but the demand is increasing. If it is possible to give a supply from Trollhattan at a lower price than the cost of production in Copenhagen, the owners of the electricity works in the latter city will have no objection to becoming customers. As Mr. Holmgren has given a promise to this effect, it is expected that the Trollhattan station will shortly submit an offer to the city of Copenhagen in this connection.

ELECTRICAL INSTALLATION FOR MESSRS. EDWARD LLOYD, LTD.

SINCE we visited the printing offices of Messrs. Edward Lloyd, Ltd., in 1903*, to inspect the electrical installation put down to drive a sextuple Hoe press, great developments have taken place.

Direct current is supplied from the Bankside station of the City of London Co. at 425 volts, through three separate sets of mains; each main goes to a switchboard, and interconnecting switches are arranged on each board, so that all three, or any one of the three, can be put on to any set of cables. It says much for the reliability of electric supply nowadays that the large printing offices in Salisbury Square are content to take their supply from one source. The switchboards are in the machine room, and they have been specially designed by Mr. Mascord, the chief engineer, and his engineering staff. The switches are of a particular type to prevent injury when being handled in emergency. The space behind the board is limited, and all the ironwork has been arranged *horizontally* so as to run parallel to the bus-bars; as a further protection all the ironwork is entirely cased in with marble. Peard fuses are used throughout, and it is possible without risk to stand close up to one of 500 amperes when it "blows." Wattmeters and maximum demand indicators are provided in each of the Hoe press circuits, so that any unusual condition can be immediately detected. Double tariff Aron meters register the energy consumed. Altogether about 165 motors are in use, ranging from $\frac{1}{8}$ H.P. to 160 H.P., the seven Hoe presses requiring about 150 H.P. each.

Hoe Presses.—The cylinders of each machine are capable of printing 55,000 copies per hour of *Lloyd's* up to 32 pages. The press draws continuously from eight rolls of paper at one time, prints it on both sides, cuts, folds, and counts out quires of 26 copies. Each machine is about 50 ft. long, 12 ft. wide, and 27 ft. high, and the weight is 120 tons, made up of about 100,000 separate parts.

In about 14 hours the seven machines use 25,000 miles of paper, and as each reel is about 4½ miles long, a large number have to be handled. To replace the reels an ingenious roll carrier, in the form of a revolving turret, has been devised by Mr. Mascord and his engineering staff. The turret carries eight rolls, four on the side next to the press, and there is a turret at each end of the press. When the supply of four reels is exhausted, the press is stopped, the turret turned round, and the press started again in two to three minutes. Then by means of a hydraulic lift, fresh reels are lifted into place.

The plate cylinders are ground to the exact size, and not merely turned up. In this way hard packing can be employed on the machines; this not only ensures better printing, but the packing lasts two or three years, instead of as many months, as has been the case hitherto. This is one of Mr. Mascord's many improvements. Printing with hard packing means that the cylinders must be ground up very accurately, and also that the stereo plates must be bored out to exact size. This boring out is effected in one cut, and the motor driving the boring machine has a device which automatically stops the knife.

It is interesting to note that the temperature of the machine room is kept at about 75° F., summer and winter, in order to keep the viscosity of the ink, and also of the oil in the bearings, about the same. There are about 800 rollers to each Hoe press, and a cold night may make 20 H.P. difference.

Motors.—The most noticeable motors in the place are those designed by Mr. Chitty and built by Thomas Parker, Ltd. Although they each give 120 H.P. at 650 R.P.M. for four hours without exceeding the usual temperature rise, they only weigh about 30 cwt. each. These machines of Mr. Chitty upset all preconceived notions in dynamo design, and he is able to get extraordinary weight efficiency by pressing the flux density to values which are seldom thought of. At the same time he makes special provision by fans on the armature shaft, and by ample air passages, to take away the heat directly it is generated. Armature reaction is

* ELECTRICAL REVIEW, Vol. 52, page 228.

minimised by dividing the field poles into two parts and connecting each half directly round to the next pole. Sparking is taken care of by interpoles, by making the commutator segments of hard phosphor bronze, and by using very high quality carbon brushes, collecting about 50 amperes per sq. in. The proportions are such that the machine gets hotter when running at 280 revolutions than when running at 650 revolutions, and yet the efficiency runs up to 95 per cent.

Slow Speed Gearing.—The motors have very large diameter nickel steel shafts, and at low speeds they drive the presses through a special gear invented by Mr. Mascord. This is something like the back gear to a lathe, and it works in conjunction with a friction clutch so that the change-over from the back gear to a direct drive is made without any jerk. At the high speeds the back gear goes out of use.

Control.—Pilot lamps are used to denote when the machine is running at full speed, and when it is crawling. The crawling speed, by the way, is set going by a push button. In another system the motors vary their speed by a modification of the Ward-Leonard system, whereby the motor-generator is only used for the low speed, and is entirely out of use when full speed is reached, thus considerably increasing the efficiency. At starting the field of the press motor is saturated to give greatest possible torque, and the high speeds are obtained by weakening the field.

In order that the speed of the presses may be under the control of the overseer, switches are fitted to the resistance units, so that parts of the resistance can be put out of use. The weight of the revolving parts of each Hoe press is about 90 tons, and by experiments it has been found that the momentum of a Hoe press is such that it stops by its own friction in 11 seconds. The controller is therefore made to come off in that time, whilst 20 seconds is allowed for it to run up to speed.

Bells for 400 volts.—When starting, a large bell is rung as an indication to the men working on the Hoe press, and this bell is worked off the same 400-volt circuit as supplies the motors. The mechanism of this bell has been worked out by the staff.

Process Blocks.—The lamps for making the process blocks have an arc over 2 in. long. This gives a light rich in chemical rays, so minimising the time required for exposure. The etching away of the metal is effected by strong nitric acid, which is kept moving in the bath by an electric motor. All extraneous metal is afterwards cut away by a "router." This is a kind of drill that rotates at 35,000 R.P.M., and which has a small fan fitted on the end to blow away the metal chips. It is driven by a vertical spindle electric motor of ½ H.P., running at 2,500 revolutions. The increase in speed is effected by three short belts.

Fire Alarms.—About 700 fire alarms on Pearson's system are installed, every small room, as well as the largest rooms, being protected. The control board is connected to Pearson's station, and thence to fire brigade stations. Should a fire occur, the fire brigade is notified in 15 seconds, and the construction of the apparatus is such that there are no false calls due to differences in atmospheric temperature. The contact device is made by two strips of steel, one thicker than the other. In case of a sudden rise of the temperature, such as is given, say, by placing a burning match under the apparatus, the thin strip expands more quickly than the thicker one, and a contact is made. On the other hand, a slow rise of temperature, such as that due to difference between winter and summer, has no effect, as there is time for both strips to expand together.

A New Motor Searchlight for the French Army.—Messrs. Harlé & Co., of Paris, have just completed a new electrical searchlight outfit mounted on a specially-designed motor-car chassis for the French military authorities. The machine, in addition to a 34-in. projector, and the necessary electrical generator, has accommodation for five men, including the driver; it can attain a speed of 16 miles per hour, and is also adapted to travel across country, in order to take the best position when the searchlight is required. As compared with previous plants of the kind, the latest addition to the equipment of the French army is stated to be much more compact, and, at the same time, can travel from point to point much more quickly.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

AMENDMENTS.

GRENADA.—An ordinance was promulgated on January 21st, 1910, providing for the imposition of an additional charge of 10 per cent. on the amount of duty payable on all dutiable articles imported into Grenada up to the end of 1910. The rates given in the ELECTRICAL REVIEW of October 29th, 1909, should accordingly be increased by 10 per cent. in order to arrive at the actual duties payable.

COLOMBIA.—The Board of Trade have received, through the Foreign Office, copy and translation of a Colombian law, dated December 7th, 1909, which provides, *inter alia*, that the following articles, among others, for mining purposes, are to be assessed for Customs purposes in the 2nd Class of the Tariff, dutiable at the rate of 1 centavo per kilog, viz.:—Machines, such as pumps, stamps, concentrating mills, dynamos and electric motors; transmission wire; apparatus for the application of motive power, whether hydraulic or steam, to mining operations; tubing and cables of iron, hemp or cotton; transmission belts of leather, cotton, hemp, rubber, or mixtures of these materials.

GREECE.—The Board of Trade are in receipt, through the Foreign Office, of translation of a Greek Government Bill (which has passed its third reading in the Chamber) providing for the modification of the rates of import duty on a number of articles on importation into Greece. In accordance with the practice in Greece, the duties established by this Bill were to be levied from the day on which it was submitted to the Chamber—*i.e.*, December 7th, 1909. It is to be noted that the duties are payable in paper currency at the fixed rate of exchange of 1 dr. 45 lep. paper to the metallic drachma. The rates below are quoted in metallic drachmae. Oke = 2·8 lb.

The following are the new duties in so far as the modifications apply to electrical and similar goods:—

Rails and their connecting portions, fish-plates, screw-joints, bolts and other pieces employed in the construction of railways, of cast or wrought-iron or steel	Free.
Metallic wires for telegraphs and electric bells ...	"
Copper in plates or slabs over 2 mm. thick, also bars	"
	Per 100 okes.
Copper in plates up to 2 mm. thick	30 drachmae.
Brass in plates, sheets or slabs	20 "
Lamp-posts and lamp brackets	10 "
*Fixed steam-engines without boilers, for industries, steamships and vessels in general; motors worked by gas, petroleum, spirit, benzine or hot or compressed air, or parts of such engines imported separately	12 "
NOTE.—This duty is not to exceed 3,000 drachmae in the case of a motor.	
*Hydraulic wheels, turbines, and, in general, motors driven by hydraulic power, and parts of such machines imported separately	12 "
*Steam boilers made of iron or steel plates, simple or with heaters or superheaters, with furnace inside or outside	12 "
*Steam boilers of iron or steel plates, with iron or steel tubes, with or without smoke-box and funnel, for factories and steamships	14 "
†Electric telephones, microphones, electric bells, buttons for electric bells and electric light, indicator boards for electric bells and telephones, telegraph apparatus, and parts of all the above...	2 "

* Formerly free of duty. † Formerly 6 drachmae per 100 okes.

Electric Smelting in Sweden.—*Commercial Intelligence* quotes a very complete report on the Domnarfvet electric-smelting works by Lars Yngstrom, who considers that by building furnaces of higher capacity, for instance, of 2,500 H.P., and by paying particular attention to the factors which have a bearing on the heat losses, it is not impossible that a furnace can be built with an electrical efficiency of about 80 per cent.—that is, one which could produce more than 3 metric tons of pig-iron per horse-power year, provided a rather rich ore is used. It has been possible to produce iron with less than 1 per cent carbon, but in this case the slag content had a noticeable amount of iron. As a rule the carbon content varied between 2 and 3 per cent. The advantages of the electric furnace over the ordinary blast furnace are as follows:—Lower installation cost, since blowing engines and heating apparatus are not required; saving of about two-thirds of the fuel required in an ordinary blast furnace; ore dust can be used without briquetting; the generated gases have a high heat value when free from nitrogen; the possibility of producing in the furnace itself low-carbon iron; less attendance, since the transportation and charging of two-thirds of the fuel used in an ordinary shaft furnace are done away with.

NEW PATENTS APPLIED FOR, 1910.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

2,981. "Improvements in electric switches." ADAMS MANUFACTURING Co., LTD. (Cutler Hammer Manufacturing Co., United States.) February 7th. (Complete.)

2,983. "Process for decarbonising metallic-filaments for incandescent electric lamps." WESTINGHOUSE METALLFADEN GLUHLAMPENFABRIK G.m.b.H. (Date applied for under Sec. 91 of the Act, February 19th, 1909, being date of application in Austria." February 7th. (Complete.)

3,007. "Improvements in or connected with shade carriers for electric lamp holders." C. SUCKLING. February 7th.

3,011. "Improvements relating to electric braking." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) February 7th.

3,012. "Improvements in and relating to dynamo-electric machines." PHŒNIX DYNAMO MANUFACTURING Co., LTD., and R. POHL. February 7th.

3,013. "Improvements in safety apparatus for use with electrical installations." W. WINSBOROUGH. February 7th.

3,019. "Improvements in electric telegraph." A. E. LAMKIN and L. HUNTER. February 7th.

3,052. "Improvements relating to cleaning and disinfecting telephone receivers and the like parts of same." W. M. BUCKLEY. February 8th.

3,068. "Improvements in motor starting switches." F. POOLEY. February 8th.

3,098. "Improvements in and relating to electric controllers." J. G. CHILDS and T. S. HILL. February 8th.

3,105. "Fibres impregnated with actinium or other radioactive substances and the process of manufacturing them." SOCIETE ANONYME BANQUE DU RADIUM. (Date applied for under Sec. 91 of the Act, September 28th, 1909, being date of application in France.) February 8th. (Complete.)

3,114. "Improvements in alternating current motors of the commutator type." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) February 8th.

3,117. "Improvements in arrangements for transmitting power by means of polyphase alternating electric currents." SIEMENS SCHUCKERTWERKE G.m.b.H. (Date applied for under Sec. 91 of the Act, February 27th, 1909, being date of application in Germany.) February 8th. (Complete.)

3,118. "Improvements in telephone exchanges." SIEMENS BROS. & Co., LTD. Siemens & Halske Akt.-Ges, Germany.) February 8th. (Complete.)

3,137. "Improvements in mechanical cars, crossings, switches, frogs, and ection insulators for supporting the overhead wires for electric tramways." RIDER. February 9th.

3,160. "Improvement in alternating current induction motors." T. H. CHURTON and S. H. SMITH. February 9th.

3,161. "Improvements in the making of sparking or ignition plugs for use in gas or petrol engines and the like for motor vehicles or other purposes." J. A. MASON. February 9th.

3,163. "Improvements in cooking and the like by electricity or otherwise." J. A. ABBOTT. February 9th.

3,174. "Improvements in electricity motor meters." G. HOOKHAM. February 9th.

3,179. "Improvements in microphones." G. A. NUSSBAUM. February 9th.

3,185. "Improvements in portable electric lamps." H. F. JOEL. February 9th.

3,186. "Improvements in electric lamps." J. R. QUAIN, C. L. TRUE and T. P. WADE-BROWNE. February 9th.

3,208. "Improvements in flexible electric wires or cables." S. C. CADDY. February 9th.

3,209. "Improvements in and relating to induction coils and transformer apparatus." H. F. BIGGE and F. R. BUTT. February 9th.

3,247. "Improvements relating to the contacts of electric ignition apparatus for internal combustion engines." B. BROOKS and F. H. ALSTON. (Date applied for under Rule 13, July 7th, 1909. An invention comprised in application No. 15,802, dated July 7th, 1909.) February 10th.

3,250. "Improvements in prepayment electricity meters." W. S. SPRAGUE and CHAMBERLAIN & HOOKHAM, LTD. February 10th. (Complete.)

3,294. "Improvements in or applicable to electric meter systems." H. W. HANDCOCK and A. H. DYKES. February 10th.

3,307. "Improvements in electric chisels." H. DREIER. February 10th.

3,310. "Improvements in or relating to electric ignition devices for internal combustion engines." ETABLISSEMENTS DE DION BOUTON (Soc. Anon). (Date applied for under Sec. 91 of the Act, February 11th, 1909, being date of application in France.) February 10th. (Complete.)

3,314. "Improvements in and relating to magnetic ore separators." F. W. C. STACHOW. (Date applied for under Sec. 91 of the Act, February 19th, 1909, being date of application in Belgium.) February 10th. (Complete.)

3,318. "Improved construction of electric switch for electric lamp holders, wall switches and the like." E. HAWKER and G. MARET. February 10th.

3,328. "Induction spark arrester for direct-current apparatus." H. LEITNER. February 10th.

3,329. "Device for protecting electric conductors." G. D. ADAM. February 10th.

3,336. "Improvements in and relating to brushes for dynamo-electric machines." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) February 10th.

3,340. "Improvements in electric telegraphy." L. L. HEALING & Co., LTD. (Juzo Kajiura, Japan.) February 10th.

3,347. "Improvements in electrical appliances for treatment of rheumatism and the like." H. WINTER. February 11th.

3,361. "Improved appliance for automatically, electrically and mechanically connecting and suspending an arc lamp electrolier or other weight." O. R. WILLIAMS and J. STEVENSON. February 11th.

3,380. "Improved form of grid for electric storage batteries." R. PAPE. February 11th.

3,381. "Improvements in electric storage batteries." R. PAPE. February 11th.

3,383. "Improvements in combined trolley-wire hangers and automatic circuit-breakers." R. G. WINTERS. February 11th. (Complete.)

3,400. "Improvements in telephone exchanges." SIEMENS BROS. & Co., LTD. (Siemens & Halske Akt.-Ges., Germany.) February 11th. (Complete.)

3,410. "Improvements in electric valves." T. J. MURPHY. (Date applied for under Rule 13, August 19th, 1909. An invention comprised in application No. 19,090, dated August 19th, 1909.) February 11th. (Complete.)

3,411. "Improvements in or relating to systems for telegraphy and telephony." J. PERRY and S. G. BROWN. February 11th.

3,417. "Improvements in and relating to electric ignition devices for internal combustion engines." H. BATT. February 11th.

3,421. "Method of supplying electric furnaces with polyphase currents." SOCIETE ANONYME ELECTRO-METALLURGIQUE. (Procedes Paul Girod.) Date applied for under Sec. 91 of the Act, August 26th, 1909, being date of application in France.) February 11th, (Complete.)

3,435. "Improvements in the electric lighting of trains." H. LEITNER. February 11th.

3,462. "Improvements in cranes and winches operated by electric motors," BROTHERT & PITT, LTD., and W. PITT. February 12th.

3,468. "Electric fire alarm push." W. BLOGG. (F. Aldendorff, Germany.) February 12th.

3,518. "Improvements relating to the reduction of the voltage at the terminals of electric lamps working on alternate-current circuits." A. W. ASHTON, February 12th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1909.

BRAKING OF ELECTRIC TRAMCARS AND LIKE VEHICLES. A. Imbery and C. H. K. Chamen. 905. January 14th.

ELECTRIC SIGNS AND THE LIKE AND A SWITCHING DEVICE FOR USE THEREWITH. H. Jenner. 1,132. January 16th.

VOLTAGE REGULATORS FOR GENERATORS AND SPEED REGULATORS FOR MOTORS. O. Andre. 1,167. January 16th.

ELECTRIC SWITCHES. E. J. Selby, W. Sanders and W. Preston. 1,662. January 23rd.

DEVICES FOR IGNITING EXPLOSIVE CHARGES IN INTERNAL COMBUSTION ENGINES. W. E. Donald. 1,755. January 25th.

UNDERGROUND DISCONNECTING BOXES FOR ELECTRIC CABLES. W. T. Henley's Telegraph Works Co. and W. H. Nichols. 1,800. January 25th.

ELECTRIC TRACTION ON THE SURFACE CONTACT SYSTEM. S. P. (Suchostawer Patents) Syndicate and H. M. Sayers. 1,875. January 26th.

ELECTRICALLY-OPERATED APPARATUS FOR DISCHARGING LIQUIDS FOR FLUSHING OR OTHER PURPOSES. W. H. Thompson and R. Thompson. 3,070. February 8th.

WATERTIGHT ELECTRIC SWITCHES. Simplex Conduits, Ltd., L. M. Waterhouse and E. Sheppard. 3,106. February 9th.

FUSIBLE CUT-OUT. E. C. Lea. 3,345. February 11th. (Post dated August 11th 1909).

ELECTRIC CABLES AND THE MANUFACTURE THEREOF. J. Stratton and E. A. Claremont. 6,151. March 15th.

ELECTRIC TRANSFORMER DISTRIBUTION SYSTEMS. Allgemeine Elektricitäts Ges. 6,313. March 16th. (Date applied for under International Convention, March 17th, 1908. Application for Patent of Addition to No. 92/09.)

APPARATUS FOR REGULATING THE FEED OF CARBONS IN ARC LAMPS. M. Wittgensteiner. 7,508. March 29th.

APPARATUS FOR ELECTRICALLY IGNITING MINERS' SAFETY LAMPS IN MINES. P. Buckley. 8,112. April 5th.

POSITIVE ELECTRODES FOR SECONDARY ELECTRICAL ELEMENTS WITH ALKALINE ELECTROLYTE. Nya Ackumulator Aktoebolaget Jungner and A. T. K. Estelle. 8,195. April 5th.

METHOD AND APPARATUS FOR DETERMINING BEARINGS, DISTANCES, AND THE LIKE, BY MEANS OF HERTZIAN ELECTRIC WAVES. J. H. M. Valoris. 10,876, May 7th. (Date applied for under International Convention, October 28th 1908.)

ELECTRIC SYSTEMS FOR POWER TRANSMISSION. Allgemeine Elektricitäts Ges. 11,839 May 13th. (Date applied for under International Convention, May 13th, 1908.)

MULTIPLEX MICROPHONE TRANSMITTERS. G. R. Webb. 12,473. May 26th.

METHODS AND MEANS FOR FIXING ELECTRIC CONDUCTOR WIRES ON INSULATORS. C. Linke. 13,786. June 11th.

ELECTRIC FURNACE ELECTRODES. C. Bingham. 14,858. June 26th.

PROCESS FOR THE MANUFACTURE OF PURE NICKEL. Societe Electro-Metallurgique Francaise. 14,946. June 26th. (Date applied for under International Convention, June 27th, 1908.)

AUTOMATIC BLOCK SYSTEMS FOR RAILWAYS. H. W. Price. 15,099. June 28th.

ELECTRICALLY-OPERATED APPARATUS FOR LOCKING RAILWAY CARRIAGE DOORS. R. B. Nelson, J. Ormsby and E. Nicholson. 15,475. July 2nd.

ELECTRIC ARC LAMPS. Siemens Schuckertwerke Ges. 15,605. July 5th. (Date applied for under International Convention, July 6th, 1908.)

IGNITION DEVICES FOR INTERNAL-COMBUSTION ENGINES. Firm of Robert Bosch. 18,457. August 10th. (Date applied for under International Convention, September 17th, 1908. Request under Sec. 19 not granted.)

DYNAMO-ELECTRIC MACHINES. F. W. Le Tal. (Westinghouse Electric and Manufacturing Co.) 19,393. August 23rd.

ELECTRIC FURNACES FOR THE TREATMENT OF GASES BY MEANS OF FLAME ARCS. Saltpetersaure Industrie Ges. 19,486. August 24th. (Date applied for under International Convention, August 25th, 1908.)

SPRING SWITCHES FOR ELECTRICALLY SETTING RAILWAY POINTS AND SIGNALS. Siemens Bros. & Co. (Siemens & Halske Akt.-Ges.) 19,662. August 27th.

CONTROL OF ELECTRIC MOTORS. British Thomson-Houston Co. (Gen. Elec. Co.) 20,246. September 3rd.

INTERRUPTERS FOR MAGNETO IGNITION PURPOSES. J. L. Milton. 21,996. September 27th. (Date applied for under International Convention, November 30th, 1908.)

MEANS FOR BALANCING THE VARIABLE STRAINS OF AN ELECTRIC MOTOR OR THE LIKE. M. Johannet. 22,317. September 8th. (Date applied for under International Convention, September 30th, 1908.)

ELECTRICAL SWITCHES OF THE PUSH-BUTTON TYPE. "Watt" Installationen fur Stark-und Schwachstrom Carl Schulz. 23,536. October 14th. (Date applied for under International Convention, October 16th, 1908.)

COMMON BATTERY TELEPHONE SYSTEMS. W. Fairweather (Aktiebolaget L.M. Ericsson & Co., Sweden.) 25,022. October 30th.

ELECTRIC POWER TRANSMITTING MECHANISM. C. C. Tuch. 25,217. November 2nd.

OVERHEAD TRACTION CONDUCTORS FOR ELECTRIC RAILWAYS. Siemens Bros. Dynamo Works, Ltd. (Siemens Schuckertwerke Ges.) 28,024. December 1st.

Electric Motors and Switches for Use in Mines.—

A meeting of manufacturers of the above plant was convened by the National Electrical Manufacturers' Association (Incorporated) and held on Thursday, the 17th inst., at the offices, Balfour House, E.C., for the purpose of appointing witnesses to appear on behalf of the Association, as representing the manufacturing industry, at the inquiry which is to be held by the Home Office for the purpose of modifying, if necessary, the rules for the installation and use of electricity in mines. We understand that nearly all the principal makers of this class of machinery were present. Six witnesses were provisionally appointed, and various resolutions were passed for the purpose of guiding them as to the evidence which is desirable,